MAY 1943

ENGINEERING
CONSTRUCTION
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# Public Works

# . . First Things First

THE most important Ward LaFrance wartime assignment is pictured above. It is a completely equipped ten-ton Tank-Recovery Wrecker unit. These tough, powerful, big fellows were a logical job for Ward LaFrance, because almost everything about them is "special". Like Ward LaFrance fire apparatus, they are built to meet unusual requirements with unfailing dependability.

Most of our manufacturing facilities are devoted to these tank-recovery trucks, and special pumpers which we are turning out for the armed forces. However, we have so far been able to continue making special civilian fire fighting units. If your need is urgent, please write us about your requirements. We shall be glad to give you full information on obtaining specially engineered equipment, and the proper procedure in securing necessary authorization to purchase it.

**WARD LaFRANCE TRUCK DIVISION**

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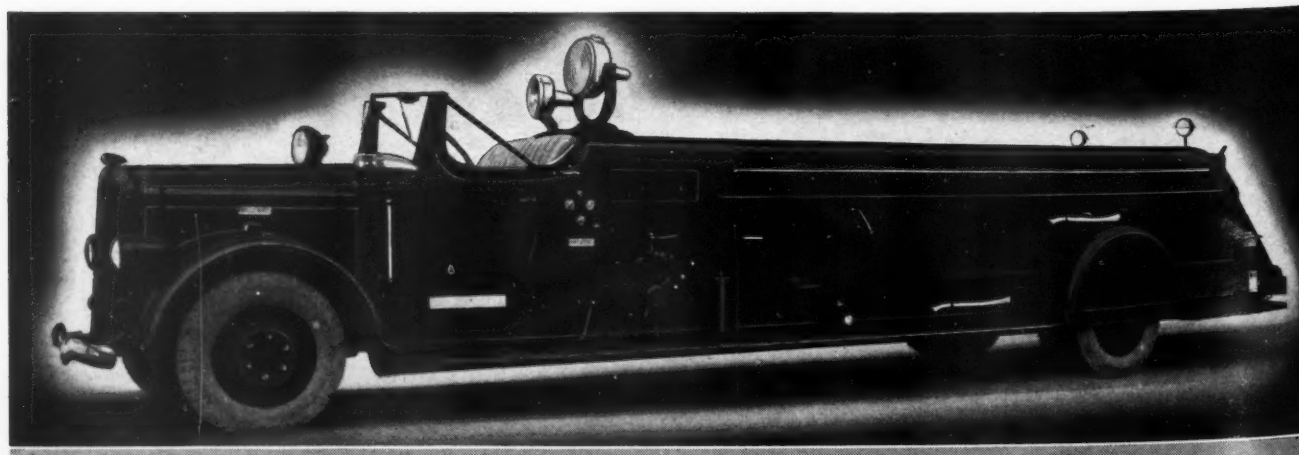
**ELMIRA, NEW YORK**



**WARD LaFRANCE**

# PUBLIC WORKS

**Founded in 1896**

***Devoted to the interests of the engineers and technical officials of cities, counties and states***

**Vol. 74 No. 5**

**A. PRESCOTT FOLWELL, Editor**

## MAY CONTENTS



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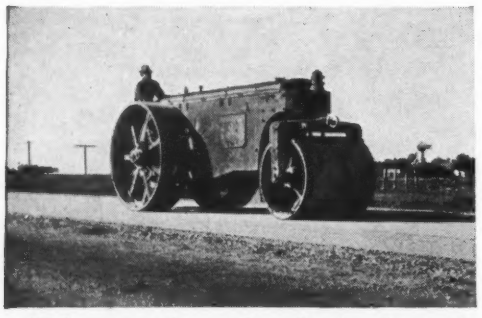
This busy Austin-Western Tandem, at a Naval Supply Depot, is compacting a lot of surface, where things have to move fast. A single lever mounted on steering post controls both reversing clutches.

# PAVING THE WAY TO VICTORY


So big war birds can take off and land safely, large areas must be kept smooth and level—the year around. This is a Cadet size Roll-A-Plane.



Well compacted, smooth surfaced and properly crowned roads make for efficient lines of communication. The machine is an A-W Autocrat.

**INDUCTED AS FAST** as they leave the production line, rollers for speeding up tasks like these, are now serving the Allied cause—in large numbers and on many fronts. . . . Though built for peace they were READY FOR WAR.

Even before the conflict started, Austin-Western had finished the toughening-up process—made them stronger, safer and simpler to handle—to meet the fast pace and rigid needs of pre-war jobs. That's why they stand up under strain, respond to quick maneuvering and work with precision, day in and day out.

When the road to victory is "paved all the way," even better rollers will no doubt be on hand, to resume normal peace-time "rolls." In the meantime this company and ALL ITS DISTRIBUTORS *stand ready to serve you in every way possible.* THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois. Distributors in Principal Cities. Cable Address: AWCO, Aurora.

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**Austin-Western**

SINCE 1859

**Austin-Western also builds Power Graders, Shovels and Cranes, Street Sweepers and a complete line of Rock Crushing and Screening Plants and kindred equipment.**

# THE WAR EMERGENCY

## Items for Water Departments

The War Production Board on April 22 announced the formation of the following Advisory Committee for the Water Supply Equipment Industry:

Government Presiding Officer: J. H. Thomsen.

Committee members: G. R. Deming, President, The Deming Company, Salem, Ohio; Harry L. Dempster, President, Dempster Mill Mfg. Company, Beatrice, Nebraska; H. S. Lauterbach, Vice-President, Sta-Rite Products, Inc., Delavan, Wisconsin; W. G. Mason, Owner, Triangle Manufacturing Company, Detroit, Michigan; Henry F. Miller, Gen. Sales Mgr., Goulds Pumps, Inc., Seneca Falls, New York; David V. Stewart, President, Columbiana Pump Company, Columbiana, Ohio; Russ Lewis, Mgr., General Dealer Sales, Fairbanks, Morse & Company, Chicago, Illinois.

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As a contribution to the Department of Agriculture's Victory Garden program, WPB at the end of March amended its previous restrictions to permit short line extensions for watering victory gardens. These extensions are expected to be made largely from material in excess inventories.

---

In April, WPB granted full use for all civilian purposes of anhydrous and aqua ammonia, and ammonium sulphate and perchlorate; chloride of lime; chlorine; and 53% of the requests for high-test calcium hypochlorite for essential civilian uses.

## Substitutes for Metal Garbage Cans

Refuse collection officials are faced with the problem of finding satisfactory substitutes for metal garbage cans. Boston's residents are using old oil drums and wooden barrels. Los Angeles is testing containers of kraft paper, plywood, and combinations of these, using waterproof bonding agents and treated with waterproofing that is resistant to acetic acid.

## Chlorine for Water and Sewage Treatment

Under date of April 24th Wallace & Tiernan Co. gave out the following as the latest information concerning the obtaining of chlorine for water and sewage treatment:

Chlorine appears to be *relatively* non-critical now and, although there are still restrictions, it may be obtained for both potable and industrial water treatment and for sewage treatment by simply endorsing your purchase orders with a statement similar to the following:

This is to certify to the supplier and to the War Production Board that the chlorine covered by this purchase order will be used only for potable water treatment, industrial water treatment or sewage treatment.

_____ (*Name of Purchaser*) _____ (*Address*)

By _____ (*Signature and Title of Duly Authorized Officer*) _____ (*Date*)

Sewage treatment plants and systems are no longer included in the utility group and are, therefore, not entitled to use Utilities Order U-1. They may, however, obtain maintenance, repair and operating supplies under Controlled Materials Plan Regulation 5A by placing the following certification on all purchase orders:

Preference Rating AA-1: MRO 5A. The undersigned certifies, subject to the criminal penalties for misrepresentation contained in Section 35 (A) of the United States Criminal Code, that the items covered by this order are required for essential maintenance, repair or operating supplies; that this order is rated and placed in compliance with CMP Regulation No. 5A and that the delivery request will not result in a violation of the quantity restriction contained in paragraph (f) of said regulation.

_____ (*Name of Purchaser*) _____ (*Address*)

By _____ (*Signature and Title of Duly Authorized Officer*) _____ (*Date*)

It should be noted particularly that although CMP Regulation 5A limits to $100.00 the value of capital equipment items which may be purchased as operating supplies, sewage treatment works are also covered by Preference Rating Order P-141. This regulation allows the purchase, as operating supplies, of items of capital equipment valued up to $500.00 on a priority rating of AA-2X to be assigned to your purchase orders by means of the Priorities Regulation No. 3 certification. However, before using either of these ratings you should refer to the Orders to determine your privileges and liabilities.

## Clearing House for Used Motors

WPB is trying to get into active service every idle electric motor and generator, and has set up a Used Motor Unit which has a list of 30,000 which are available and is acting as a clearing house for owners and prospective buyers of these. Plants desiring to obtain motors or generators and those having any that they can spare should get in touch with this Unit at once.

## Specialists for the Army and Navy

The Joint Army-Navy Personnel Board desires voluntary inductions of enlisted specialists into the Army for duty with the Corps of Engineers. They may volunteer for service with either combat, aviation or special service engineer troops. All over 18 years old are eligible. Those desired include surveyors, general, instrument men and topographic; water supply foremen; chemical laboratory assistants; draftsmen; water filter operators; bridge builders; highway construction machinery operators, concrete mixer operators, and scores of other technical and machinery specialists.

## Use Cast Iron Soil Pipe

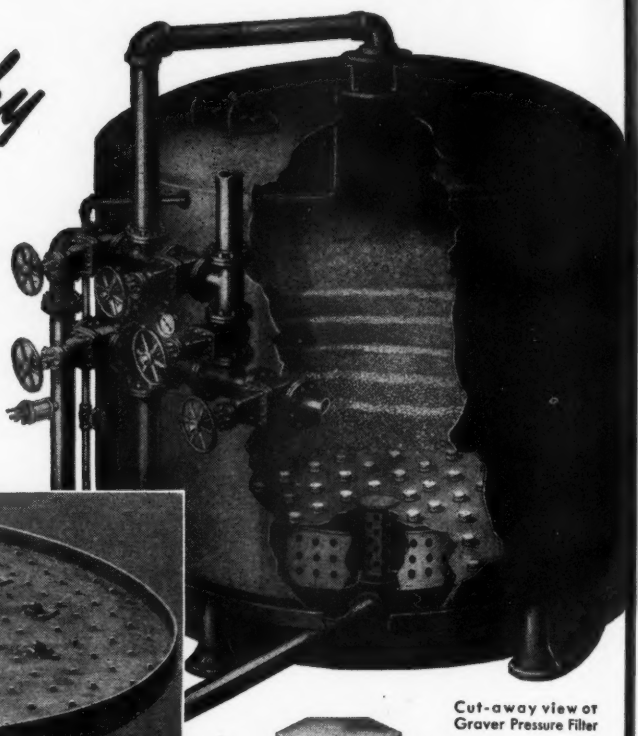
The use of cast iron soil pipe and fittings for sanitary drains in and under buildings should be continued as long as the supply of raw materials from which these products are manufactured is adequate, according to the Plumbing and Heating Division of WPB.

*Another reason why*

# GRAVER

## PRESSURE FILTERS

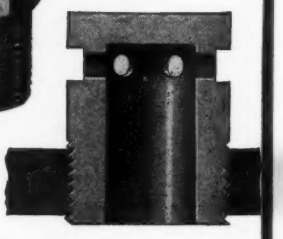
### *insure highest filtration efficiency*



Cut-away view of Graver Pressure Filter

Above—Strainer plate and stainless steel strainers

Stainless steel strainers showing recessed orifice channel



THE FILTERING CAPACITY of a pressure filter is based on the horizontal cross-sectional area of the filter bed. Unless the underdrain system provides for even distribution over the entire area, the water will pass through only a portion of the bed and the filtering capacity will be materially reduced.

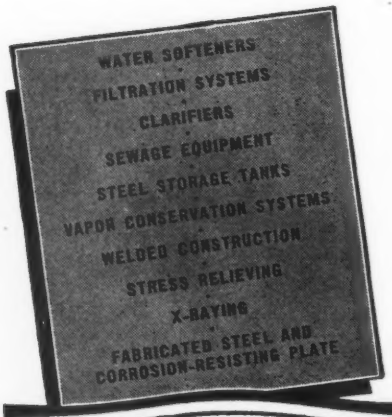
The strainer plate type of underdrain system as provided in all Graver Pressure Filters assures even distribution of incoming water and backwash water throughout the entire filter bed. This system is designed so that the use of strainers set on 6″ centers distributes the water evenly. In addition, an expansion chamber below the bed assures an even amount of backwash water reaching each strainer. This permits proper backwashing and prevents clogging of the filter bed. It also acts as a collection chamber for filtered water during filtering operation.

Another important point is that all strainers used in Graver Pressure Filters are made of stainless steel. This type of material positively prevents closing of orifices due to corrosion. Also, the use of stainless steel strainers avoids electrolytic action between strainers and strainer plate.

The Graver type of underdrain system eliminates the need for any concrete grout or fill, therefore, no cracks—no stagnant water—no breeding places for bacteria.

Before you definitely decide on any type of equipment for filtration of water for any use, investigate the advantages offered by Graver equipment.

*For further details on Graver Pressure Filters request Bulletin 313*

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Vo. 74. No. 5


Mishawaka Street Department buildings, men and equipment.

# Low-Cost Oil Aggregate Paving in Mishawaka, Indiana

By FRANK J. MILLER
City Engineer, Mishawaka, Ind.

**Dust nuisance of 75 miles of gravel streets remedied by laying an oil aggregate mixture, which provides a smooth, dustless, easy riding surface. Laid by WPA workmen, most of them inexperienced. Same material is used for patching.**

OIL aggregate has been used in Mishawaka as a street surfacing material for two years. Prior to that time the city, with the assistance of the Works Progress Administration, graded and graveled approximately 75 miles of secondary streets, which since that time have cost the city and property owners much inconvenience and money, due to the creation of a first-class dust nuisance.


Getting ready to widen and pave street.

The need for a satisfactory, low-cost surfacing or dust-laying material for these streets was urgent in order to appease the residents and keep the streets in a serviceable condition. Our first thought was of the road mixing process, which we tried and obtained fair results. But this type of work was abandoned because of the difficulty of working the gutter lines to a proper grade, and also because the surface inlets and manhole covers found in city streets interfere with the construction. Furthermore, the road mix method did not lend itself to the accurate control of mixture which we considered desirable.

Early in 1940 we began to gather as much information as was available concerning oil aggregate mixtures. The State Highway Department of the State of Michigan, the Asphalt Institute of New York and the Standard Oil Company of Indiana were contacted with more than pleasing results; all were anxious to furnish us with detailed reports of their experiences and research in this type of mixture. We received copies and suggestions for specifications from all to whom we had written. From this helpful information and

**From left to right: Fred Waidner, street commissioner; Frank J. Miller, city engineer; Cyriel A. Himschoot; and, extreme right, Carl J. Castleman, mayor.**

from some experiments of our own, we wrote specifications which we think cover the field pretty well for our locality.

Our specifications provide that the aggregates shall consist of natural bank-run sand and gravel, crushed or uncrushed; slag, crushed stone, crushed mine rock or stamp sand, supplied in combination or separately as coarse aggregate and fine aggregate, which will produce a uniform gradation within the following limits:

| | |
|---|---|
| Passing ¾" square screen | 100% |
| Passing ⅜" square screen | 65-90% |
| Passing 10 mesh sieve | 40-50% |
| Passing 40 mesh sieve | 15-30% |
| Passing No. 200 sieve | 5-10% |

Due to the presence of an abundance of gravel within the city limits, we use natural bank-run sand and gravel almost exclusively. Physical requirement for mineral aggregates are few; all sources of aggregate used in oil aggregates are inspected and approved by the Engineer.

Bituminous materials SC No. 2, SC No. 3 and SC No. 4, used for the production of oil aggregate, must meet the requirements of the Indiana State Highway specifications for bituminous materials. Revised specifications for asphalt road oils have recently been issued by the Asphalt Institute and approved by the asphalt committee of the A.A.S.H.O. This revision eliminates the overlapping of consistency requirements between adjacent grades of the different types of oils and secures greater continuity in the viscosity rating.

*Control of Mixture:* The control of the mixture at the mixing plant is very essential. The first requirement is a competent plant manager, who must see that the following procedure is adhered to:

(A) Moisture in the aggregates should be reduced under 1%; in so doing, the aggregate should not be heated over 250 degrees F.; a temperature of 150 degrees to 200 degrees F. is preferable.

(B) Asphaltic road oils should not be heated to a temperature of more than 175 degrees F.

(C) Mixing time of dry aggregate should be not less than 15 seconds, and 45 seconds after oil is applied.

(D) A daily testing report should be made by the plant inspector. At least three extractions and numerous aggregate gradations should be made daily; composite daily mixture samples and frequent aggregate and filler samples should be taken and forwarded to an approved testing laboratory for check. Daily reports should be made in duplicate, one report forwarded to the office of the city engineer and the other retained by the plant inspector.

A continuing daily record of the operations at the plant should be kept by the plant inspector.

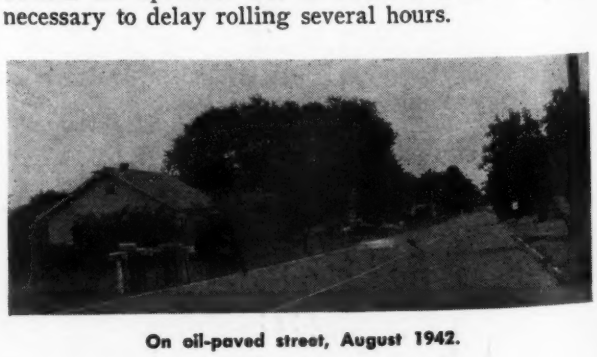
During the summer of 1940, we laid 42,495 square yards of plant mix oil aggregate 2" thick on gravel bases primed with S.C. No. 2 road oil, ¼ gallon per square yard. This was done at a total cost of twenty-five cents per square yard to the property owners. The city furnished equipment and supervision and the W.P.A. furnished the labor. In 1941 the program was much the same excepting that it was increased to 84,183 square yards of oil aggregate on prepared gravel bases and 14,670 square yards of resurfacing on cement concrete bases. Part of this resurfacing was over an old county highway that passes through the city, the concrete base of which was 18 ft. wide, and here the street was paved to a width of 36 ft., a 6" gravel base 9 feet wide being constructed on each side of the concrete base. The remainder of the resurfacing was on a main downtown thoroughfare. The concrete bases were prepared with a prime coat of light R.C. cut back.

Our yearly paving program is built upon a voluntary plan, whereby the property owners on any given street sign an order to the City Engineering Department authorizing it to pave the street in front of their property. On the same order sheet is a cost column setting out the exact cost to each property owner, which when signing they agree to pay not later than 12 months from the date of completion.

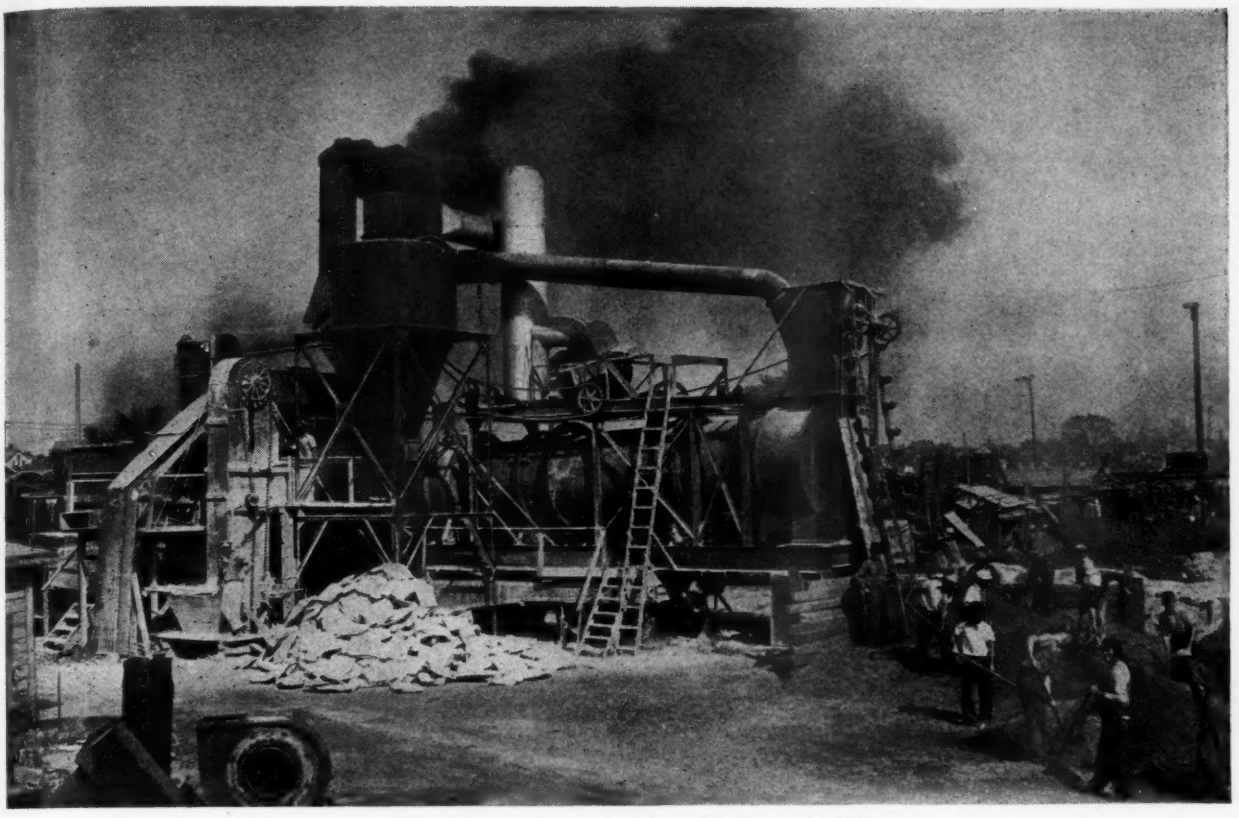
The plant used for preparing this material is a regular hot-mix asphalt plant with a batch capacity of 1000 lbs., consisting of a drier, dust collector and twin pug-mill mixer. The plant is equipped with a ¾" square screen to prevent oversize, and a sand screen to completely separate the aggregate into a two-compartment bin; accurate scales for weighing the aggregate, filler and oil is also provided.

The equipment used for laying oil aggregate is an Overmander spreader, manufactured in Marion, Indiana. This spreader is not self-propelled and must be towed by the batch trucks. Additional equipment used in street construction and maintenance includes a 6-bag Koehring concrete mixer, concrete finishing machine, ¾ yard dragline, two 8-ton rollers (one tandem), 15 dump trucks and several thousand feet of road and curb forms. Most of this equipment has been purchased during the past four years on the rental purchase basis from WPA funds.

The surface is laid in 9-foot strips and in two layers. As a rule, the first course is laid and rolled and traffic is then allowed on the street, which helps considerably to compact the surface. Rolling with an 8-ton or 10-ton roller is limited to once or twice over in a straight line; cross-rolling or turning on fresh mixture is not allowed. In cool weather the roller follows close behind the spreader but in hot weather it may be necessary to delay rolling several hours.



**On oil-paved street, August 1942.**



**The city's asphalt plant, purchased in the spring of 1940.**

We usually continue to lay oil aggregate as late in the season as possible or as long as the base is dry and free from ice. We expect some day to apply a seal coat to the oil aggregate surface on some of the more heavily traveled streets; this will be an RC-1 or RC-2 with a layer of pea gravel or stone chips. So far, we have not found it necessary to apply a seal coat to any of the surfacing we have done.

When properly laid, oil aggregate presents a smooth, easy riding surface which we think is the requisite for a good low-cost surfacing. This type of pavement seems to be especially suitable for Mishawaka because there is an abundance of sand and gravel within or near the city and the physical requirements thereof are easily met.

Laying of this type is a simple matter and can be done with inexperienced men, although some skill is required of the rakers and gutter line men. The material is always pliable and there is no need to hurry about getting it into place, as it can be worked any time after it is mixed, so long as the temperature is not too low.

After the material is in place on the street, rolled and open to traffic, oxidation takes place on the surface only, and this only to a depth of about 1/16 of an inch. Should the surface be damaged in any way, such as a breaking through of the surface, it immediately will be sealed or repaired by traffic.

This pavement is not brittle, and when a hole develops it seals itself instead of increasing in size and depth, as is usual with other types of pavement.

Pavement patching has been simplified by the use of this material. We stock pile the amount we think we will need and apply it to all types of pavement, and use it for patching streets during the winter as well as summer. Street car rails imbedded in concrete streets have been covered with a fine mixture of this material, the covering being from ⅛" to ½" thick, and such construction has now been in place on a State highway for three years.

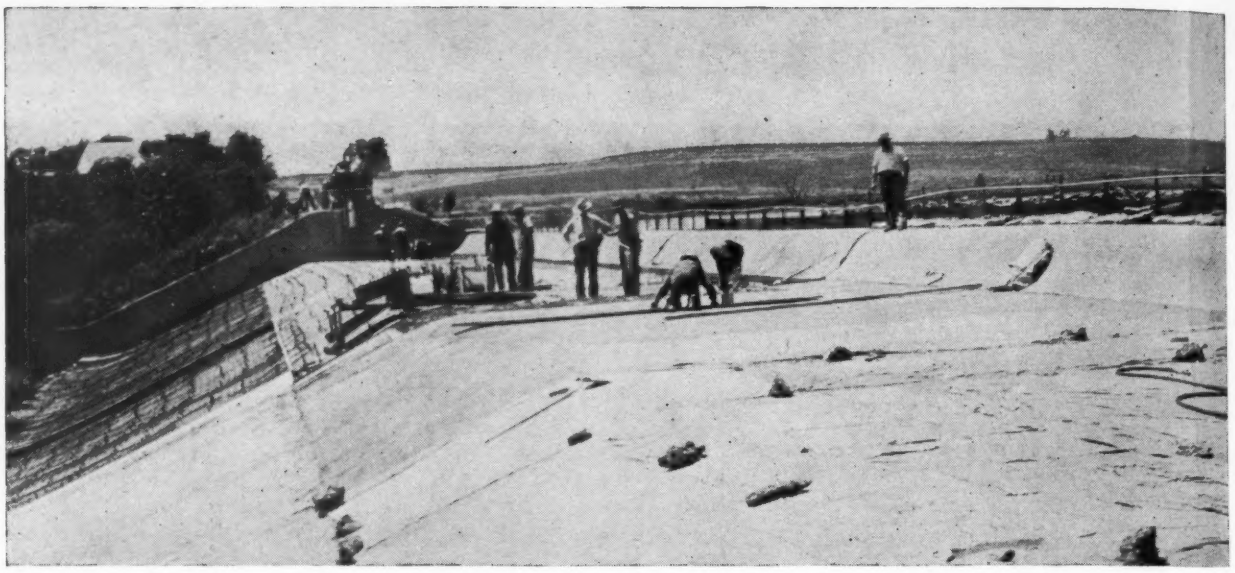
Regarding the force account plan compared to letting contracts for street work, I would say that each has its advantage. In letting a contract, the engineer sets up plans and specifications, which the contractor must follow; the contractor also is usually an experienced construction man with an experienced crew of men, therefore the results are better materials, better workmanship and more speed in completing the job.

Under the force account plan, the engineer sets up the same plans and specifications, but the city is very reluctant to purchase better materials from an outside source when there are materials nearly as good locally, although they do not meet the specification. All of my experience under the force account plan has been with W.P.A. workmen, and of course, we could not expect the workmanship that we would get from an experienced contractor's crew. Since the lack of W.P.A. workmen, we have been giving serious thought to the matter of forming a regular paving crew on the city payroll, which in time would become experienced and should prove very satisfactory. Of course, when the work is done by the city the cost to the property owner is greatly reduced.

## Flight Strips in Service

The first flight strip, which is located on the southeast coast, was completed last June. Since then more than a score have been completed or are under construction, and others are in the planning stage.

These strips have already been used for a dozen or more emergency landings. The first one saved from probable destruction an army bomber which was hemmed in by low ceilings that closed every airport within safe flying distance, but landed safely on this strip 30 miles away.



**Bars and wire mesh in place on a section of the slope. Top ready for pouring. Mixer at top of vertical spillway wall. Foreground of spillway finished.**

# Creston, Iowa, Bought Water Works, Doubled Capacity

**By J. B. RUSSELL**

**Manager and Engineer, Creston City Water Works, Creston, Iowa**

THE repaving of the concrete spillway at Summit Lake probably is the closing chapter of Creston's major catastrophe. For a better understanding of the water problem, let us begin by dropping back a few years to the severe drought year of 1934.

The water supply of Creston failed completely. Water was shipped in by tank cars from Council Bluffs, a distance of 100 miles, for a period of six months. During this time, water for cooking and drinking purposes was barely available and bathing was, of course, severely curtailed unless one was fortunate enough to have an old well in the back yard or perhaps a friend who had one. To really appreciate the community's problem, try getting along on 5 gallons of water per day per person in a modern home—which was the maximum consumption allowed.

Before and during the drought, the water company was privately owned and of course was charged with the entire responsibility, and feeling against the organization was strong. The direct cause of the trouble was insufficient storage. The company's public relations were in a deplorable state, so much so that when an attempt was made to acquaint the citizens with the seriousness of the situation, there was very little, if any response.

Both of these situations were faults of the company and were properly charged against them. However, the company had operated a number of years without a franchise, which it had repeatedly requested but failed to obtain. Under this condition it could hardly be expected to make or undertake expensive improvements. Thus the matter drifted along with no action by either side and evidently little interest.

This situation serves to illustrate how easily such an emergency could occur through misunderstanding and negligence between residents of a community and waterworks officials. It also illustrates the value of good public relations built on confidence of the community in their waterworks officials. It is doubtful that the old company had Mr. Average Citizen's confidence, and when the danger was pointed out to the public, it was only interpreted as another excuse for the company to get something for itself.

In the early spring of 1934, it became apparent that a water shortage was inevitable and a state of emergency was declared, limiting personal consumption to 5 gallons per day per capita, and arrangements were made to ship about 150,000 gallons per day in tank cars from Council Bluffs, Iowa. Shipments started July 1st and continued until the middle of December, when a heavy rain on the bare, frozen watershed again filled the reservoir and ended the immediate emergency.

Mother Nature having convinced the populace that Creston really had a water problem, which was now temporarily adjusted but not adequately, plans for a permanent solution became the subject of conversation. There seemed to be three feasible methods for solution to the problem:

1. The city could grant the private company a franchise and the company would agree to make necessary improvements.

2. The city could purchase the existing property, pay for it out of earnings, and operate it as a municipal utility.

3. The city could construct an entirely new plant and distribution system.

The battle finally raged over the 2nd and 3rd solutions. After several months of dispute and two elections, Issue No. 2 carried and the City Council was authorized to purchase the water works property and

**Six months' scarcity of water due primarily to unfriendly public relations with the water company. Problems solved by purchase by the city and doubling the capacity of the reservoir.**

# d Eliminated Shortage

to provide for its administration by a Board of Trustees. Members of the present board are C. A. Nord, Chairman; J. C. Delay, and W. C. Strunce.

On Feb. 11, 1935, the plant became the property of the city of Creston. The first adjustment to be made was to create additional storage. The simplest method to increase the capacity was to raise the dam, due to the fact that the watershed of 24 square miles was more than adequate for a reservoir several times the size of the one in use. The existing earthen dam was of conventional design with upstream slope of 2:1 and back slope of 1½:1. Total length was 860 ft., with a concrete spillway section near the center 244 ft. long, 30 ft. wide, with a 30-ft. tailrace. The lake at this time was 1½ miles long and covered 220 acres of land, impounding about 400,000,000 gallons of water. It was decided to raise the crest 3 1/3 ft., which was the maximum increase allowable due to a highway bridge three-fourths of a mile north of the dam. This increase, however, doubled the capacity of the reservoir and provided storage for over a two-year supply.

The spillway crest was raised 3 1/3 ft. by means of a concrete section with a 2:1 upstream slope and a curved downstream face. This job was completed in May, 1935. The rest of the spillway was repaved in the summer of 1942. The old 6" concrete slab built in 1900 was being continually patched, and during the past three or four years deterioration seemed to increase quite rapidly.

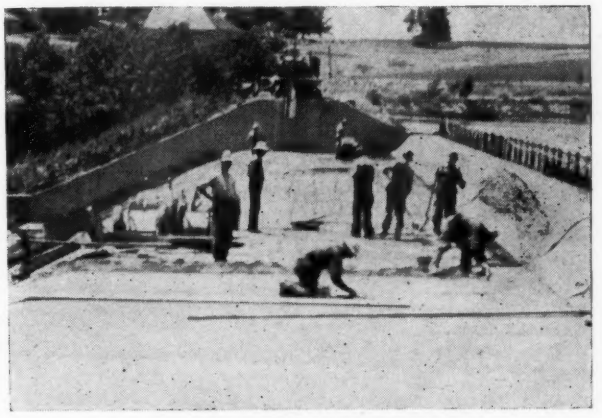
Accordingly, it was decided to repave the spillway, utilizing available WPA labor. The section left to repave was 60 ft. wide and 244 ft. long, requiring approximately 271 cu. yds. of concrete. First, 3660-1½" holes were drilled in the old slab, spaced at 2' centers and drilled from 5" to 6" deep. Next, ⅝" reinforcing bars were grouted in, leaving the bars projecting 5" to 5½" vertically above the old slab. To these vertical bars 6" x 6" electric weld wire mesh was fastened. The concrete slab was poured in two rows of six sections each, all sections staggered. Construction equipment and material consisted of a 2-bag concrete mixer, a sufficient number of concrete buggies and wheelbarrows, two 110-cu. ft. compressors and four jack hammers, also 485 bbls. of cement, all furnished by WPA. The balance of necessary material was furnished by the water works and consisted of 9 carloads of Class V Platte River concrete aggregate, 900 ft. of asphalt joint strips, 15,000 sq. ft. of wire mesh reinforcing, 4,500 lb. of reinforcing steel, and sufficient steel drills and bits.

During the time of construction, the lake level was from 2" to 5" below the spillway crest. Flash boards and sand bags were placed along one-half the length of the spillway and then moved on along as construction proceeded. This eliminated any water trouble with the exception of one time, when a storm and high winds over the lake raged at night and flash boards and sand bags disappeared. The concrete sections were all cured by means of wet burlap strips. Luckily all concrete had been poured sufficiently prior to the storm so that no damage was incurred, for with water rushing over the spillway as it did, a freshly poured section of concrete might have caused disaster and headaches.

All construction was carried on using Iowa State Highway Commission specifications for concrete construction, including concrete mix for Class V aggregate.

The project cost to the water works, including all materials, supervision, lumber, truck rental and miscellaneous, was $2,032.10, giving a cost of $7.50 per cu. yd. of concrete. All labor furnished by WPA amounted to approximately $1500 and WPA equipment rental totaled $510. Also 485 bbls. of cement were furnished by WPA at a cost of $1,170.95, making the total WPA cost of $3,180.95 or approximately $11.75 per cu. yd. This gives the total cost as $5,213.15, or $19.25 per cu. yd.

The total cost is undoubtedly high, one reason for which was the type of labor. With very few exceptions, the labor was unskilled and many times more workers were assigned to a project than were actually necessary. It is not the writer's intent to criticize or raise any issues in conjunction with day labor or contract methods. WPA labor and materials were available, and as before stated, the water works cost was approximately $7.50 per yd. The job is finished, which creates one less worry for next year.



**Concreting crest of spillway.**

Arthur E. McGuinness

# The Construction of T ap

By ARTHUR E. McGUINNESS
City Engineer, Warwick, R. I.

THE City of Warwick, Rhode Island, has been termed the fastest growing community in New England during the past decade. Twenty-two closely built up sections spotted here and there in the thirty-six square mile municipality make a nucleus in which are now housed some 30,000 residents. The proximity of Warwick to Providence, the principal city and capital of Rhode Island, together with the low tax rate and country atmosphere have greatly encouraged migration from neighboring cities.

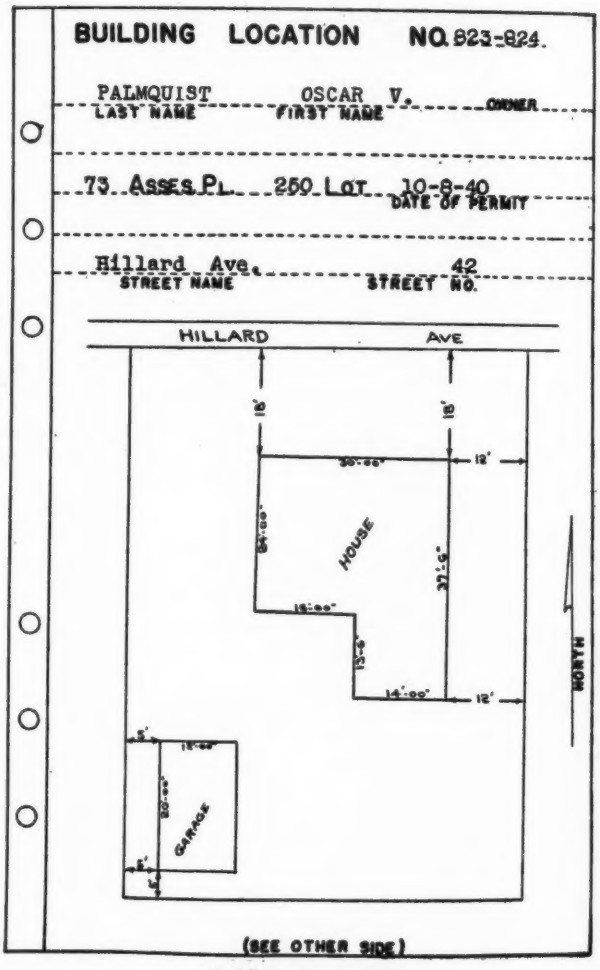
Municipal problems resulting from an increase in population gave rise to the need for mapping. Property must be taxed fairly; streets must be built; water mains must be extended; houses must be numbered; planning must be practical. These main items, along with many problems incidental to them, led the writer to believe that an aerial survey of the entire city would set up a master map from which all municipal departments could work.

Tax maps are not new in Warwick but those existing are inaccurate and incomplete. The procedure for making them seems to have been to start drafting on a 30" x 40" plat card and, upon reaching the edges, to place similar cards adjacent and to continue on. This resulted in the edges of these cards showing a partial piece of property belonging to one person with the remainder showing on one, two, and sometimes three other plats. Reference to such properties necessitate handling as many plats as are involved and matching them as well as possible. Plat replacements and intensive usage have aggravated these edge conditions to the point of giving a wrong picture of the property lines as they exist. A dual scale in the plat system has also proved most confusing.

It is not uncommon on these old plats to have a building improperly assessed. An owner of three or more adjacent lots is sometimes assessed for a building on one of them, but not always on the correct one. Lots involved in tax sales, being subject to that condition, are a source of trouble for the tax assessors.

Many land evidence records are vague concerning angles and distances on lot lines. When these are entered on the plats much judgment is necessary, and even then assumptions must be made.

*Requirements:* Maintenance of the assessors' plats and the results of talks with municipal department heads, land title authorities, and agents from other cities aided us in setting a policy regarding our new plats. Tax maps should contain details concerning the operations of as many municipal departments as is practicable. They should be drawn on tracing linen




Building survey card.

and then stored in a fireproof vault. Gelitho prints on linaura cloth should be made for the Building Inspector's Department, the Zoning Board, the City Clerk, and the Tax Assessors. One gelitho print of each plat on first grade drawing paper should be mounted on a 30" x 40" card for record. A scale of 100 feet to the inch should be maintained throughout the city. The edge lines of all plats should be natural bounds such as lot lines, railroads, waterways, highways, etc. Plats should be numbered in the lower right corner under an arrow indicating True North. Features shown on the maps should include lot numbers, lot areas, buildings, street names, street numbers, gas and water mains,

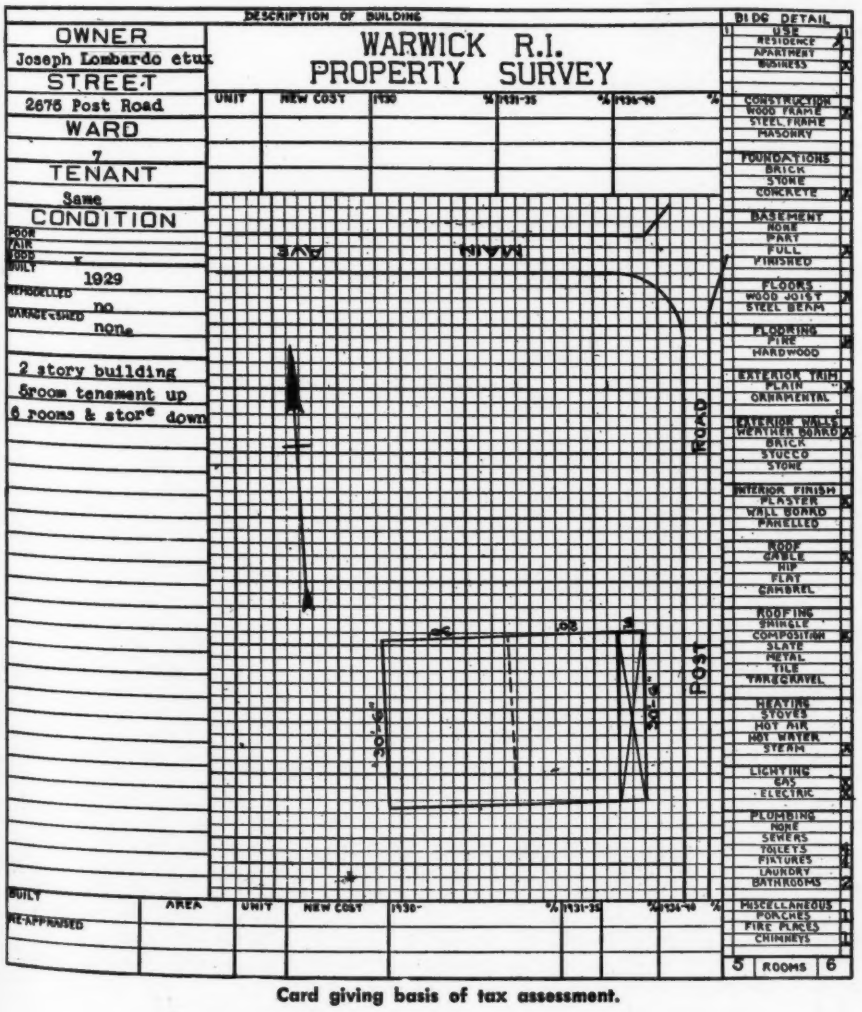
# Taps From Aerial Survey Plats

**Requirements for a system of tax maps, and how they were met at Warwick, R. I., making use of aerial surveys and contact prints of the 185 areas into which the city was divided. Preparation of maps from mosaic enlargements.**

swamp outlines, and waterways. A simple system of transfer from the old to the new plats should be set up to insure a minimum of confusion during the transition period.

With this policy in mind, specifications for aerial survey work were drawn. We first described the type of contact prints we desired and then specified the kind of mosaic enlargement suitable for our task. Cooperation of a mapping division at Harvard University, headed by Col. James W. Bagley, U.S.A., Retired, contributed to an intelligent method of procedure at this stage. Contact prints at a scale of 600 feet to an inch proved a medium between an ideal system and the policy of our ever-economic municipal administration. This is said with the thought in mind that a contact print of 300 feet to an inch is ideal, but in our case the additional cost did not appear to promise proportionate additional returns.

*Procedure:* Invitations to bid on a contract to make the specified contact prints and mosaic enlargements were extended to five aerial survey companies on April 11, 1940. Standard Aerial Surveys Incorporated of New Jersey, with a bid of $2,410.23, was the company to whom the contract was awarded. Arrangements were then speedily made to photograph the city during the month of May, in order to take advantage




Card giving basis of tax assessment.

| PLAT OF CITY NEW CARD. LOT | NUMBER OF SQ FT OR ACRES | DESCRIPTION OR RECORDED PLAT | PLAT OF CITY OLD CARD. LOT | NUMBER OF SQ FT OR ACRES | DATE OF CHANGE | REMARKS OTHER MAPS |
|---|---|---|---|---|---|---|
| 267 | A-1 | 10780 | Part of lot #1 Greenwood High. Plat | 73 700 | 10780 | | Joseph Lombardo, etux |
| " | A-2 | 19816 | Part of lot one Greenwood High. Plat | 73 701 | 6716 | | Teresa F. McDonough |
| " | A-2 | 19816 | " " " | 73 702 | 6570 | | " " " |
| " | A-2 | 19816 | " " " | 73 705 | 6528 | | " " " |
| " | A-3 | 10311 | " " " | 73 707 | 10311 | | Walter W. Dyberg |
| " | A-4 | 6616 | " " " | 73 706 | 6616 | | New Eng. Tel. & Tel. Company |
| " | A-5 | 51538 | " " " | 73 703 | 6502 | | Mary E. Jensen |
| " | A-5 | 51538 | " " " | 73 704 | 6528 | | " " " |
| " | A-6 | 51538 | " " " | 73 3 | 6896 | | " " " |
| " | A-5 | 51538 | " " " | 73 4 | 6363 | | " " " |

Part of a tax assessment record.

Print of aerial survey.

of the height of the sun in the heavens and the absence of leaves on trees. These factors were considered to insure a minimum of shadow and a maximum of property line detail on the photographs.

The 600 foot scale prints resulting were sent us for outlining preparatory to making the mosaic enlargements. In order to be assured of having the edge lines of these enlargements fall where natural land marks exist, much effort was expended on this phase of the work. A cardboard with a 4.9" x 6.5" cut out area made a template which represented to scale the working area of an enlargement. It was placed on the contact prints and moved about until the desired area was encompassed. The area was then outlined on the prints with a grease pencil and the template moved to outline another area. This process was repeated over the entire city, necessitating in all 185 such areas. The contact prints thus outlined were then numbered and returned to Standard Aerial Surveys Incorporated for enlargement.

A W.P.A. project covering the drafting work anticipated was set into operation shortly after the mosaic enlargements arrived from New Jersey. The varied personnel available prompted mechanical lettering for standardization. A schedule of operations to secure identical handling by the draftsmen of all plats during construction follows:

1. Transcribe data from existing tax plats and tax title cards to the first four columns of Form B.
2. Outline new plat area in pencil on mosaic print of the same number and ink in.
3. Cover mosaic with a sheet of Ozalid 30" x 46" holding a number and north arrow space in the lower right hand corner and pencil in the following:
   a. Outline set up in operation number 2.
   b. Plat number, abutting match lines, abutting plat numbers, and the north arrow.
   c. Street names from the Warwick street map.
4. Outline the old plats in pencil on the Ozalid.
5. Draw in pencil on Ozalid recorded lots from recorded plats and unrecorded lots from deed descriptions.
   a. Check with occupation shown on the mosaic underneath.
6. Revise Ozalid in pencil to make lots conform with present deeds.
   a. Check with old tax plat and tax title cards.
   b. Keep up to date for the duration of the project.
7. Draw in pencil on Ozalid, the old numbers and areas from the old plat cards.
   a. Check unrecorded areas with a planimeter.
   b. Check recorded shore line lots for area when record plat does not show a figured area.
8. Draw in pencil on Ozalid the outlines of all buildings.
   a. Check with building survey cards and existing tax book noting discrepancies on Form D.
   b. Draw in buildings erected since May, 1940 as shown on Form C.
   c. Keep up to date for duration of the project.
9. Finish Ozalid in pencil showing brooks, railroads, swamps, cemeteries, etc.
10. Cover Ozalid with a sheet of tracing cloth 30" x 40".
    a. Do not allow the drawing to cover more than 29" x 38½".
    b. Draw in ink the street lines, adjoining plat lines, brooks, swamps, and railroads.
11. Draw in ink the plat number, north arrow, adjoining plat numbers and scale. Use template No. 175 (slant).
12. Print the names of streets, railroads, ponds, brooks, etc.
    a. Use template No. 175-C (slant).
13. Combine in pencil when possible, lots owned by one person.
    a. Check ownership with Form B and ink in.
14. Ink in all buildings.
15. Print with pencil, new lot numbers.
    a. Number lots from top to bottom, going from left to right.
    b. Print the block letters in ink on the reverse side of the tracing cloth using block template.
16. Print new lot areas in pencil.
    a. Check the totals of combined lots to be certain that no error has resulted from transposition.
17. Print new lot numbers in ink.
    a. Keep numbers clear of buildings and recorded lot lines.
    b. Use template No. 140-C.
18. Complete Form B in pencil.
    a. Using the tracing and Form B, complete Form A in pencil.
19. Print in ink within the buildings, the street numbers from the City of Warwick House Numbering Forms.
    a. Numbers are to be at right angles with the alignment of the street.

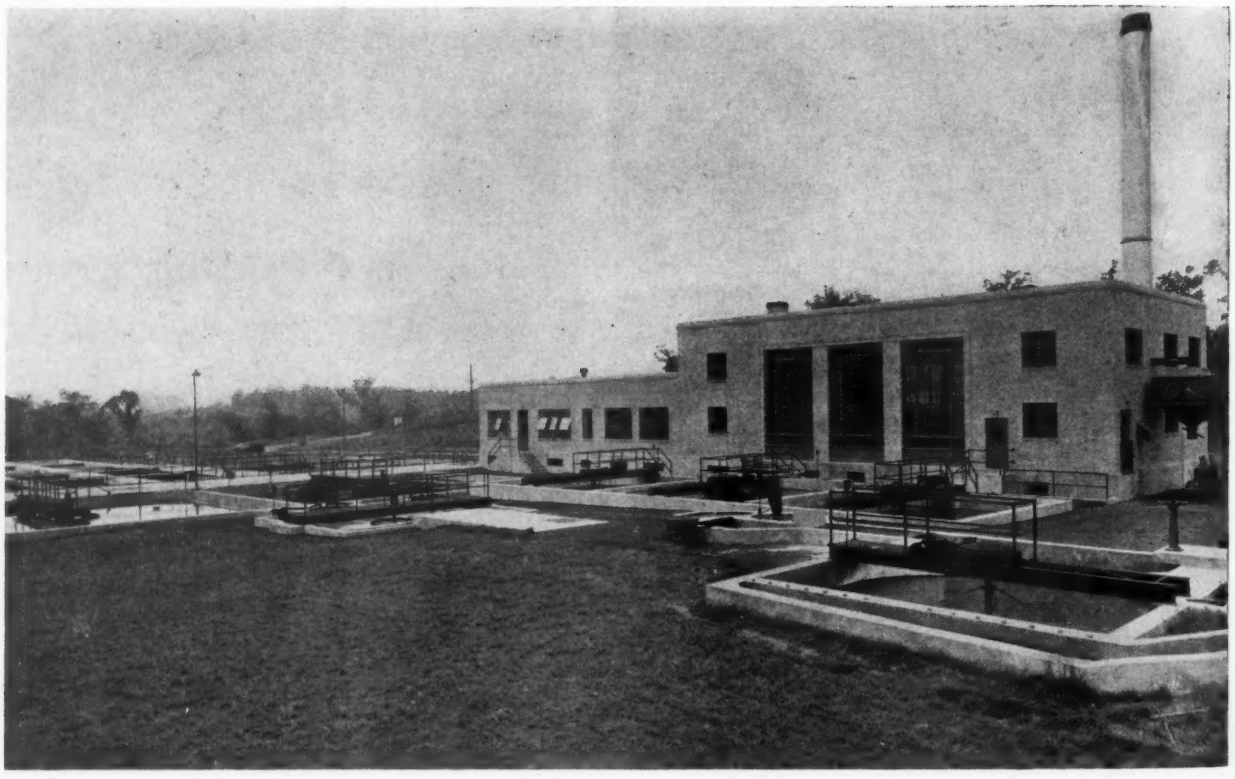
*(Continued on page 44)*

One plat of the completed tax map.


PLAT 268
MAIN
CHAPMANS
HILLARD
GREENWOOD
POTTERS
NATICK
VAUGHN
MYRTLE
GILLAN
TRINITY
SHARON
BURT
POST
AVE
ST.
ROAD
DELAINE
CREST
PACKARD
WINSLOW
BLVD.
LE VALLEY
NEW YORK NEW HAVEN AND HARTFORD RAILROAD
GORTON'S POND
PLAT 266
PLAT 245
One plat of the completed tax map.
267
SCALE 1" = 100'

# Up-to-the-Minute Cranston, R. I., Sewage Disposal

**A 5.5 mgd activated sludge plant, comprising a mechanically cleaned grit removal unit, comminutor, grease removal unit, primary settling tanks, aeration tanks, final settling tanks, chlorinators, tanks for sludge concentration, digestion and elutriation, vacuum filters and incinerator.**



**Activated sludge plant at Cranston, R. I. Detritor at extreme right. Three sludge thickeners in front of operating building, two for elutriation. At left, primary clarifiers in front of aeration tanks.**

THE City of Cranston, Rhode Island, in June 1939, commenced construction of a comprehensive sewerage system, including about 96½ miles of gravity sewers, about 3½ miles of force main sewers, seven sewage pumping stations and a complete sewage treatment works. Previous to undertaking this project, the city had been entirely without public sewerage facilities.

To date there have been built about 63 miles of gravity sewers and force main sewers together, nearly 27 miles of service connections, 5 sewage pumping stations and the sewage treatment works.

The project includes numerous interesting features, of which its "up-to-the-minute" sewage treatment works is outstanding. The works include units for primary treatment to remove grit, grease and settleable solids; units for secondary treatment by the activated sludge process; units for disposal of sludge by digestion, vacuum filtration and incineration; and an operating building.

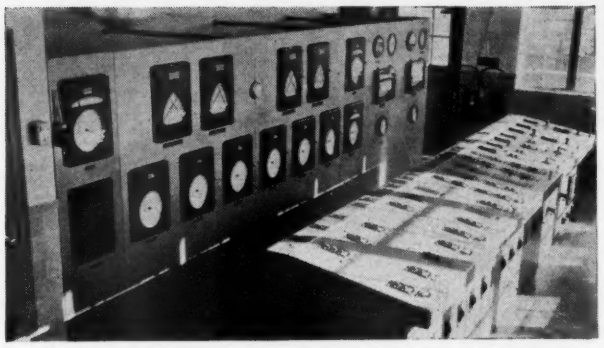
The sewage treatment works was designed for the estimated rate of sewage flow in 1950. The total population of Cranston at the present time is about 50,000 and the estimated 1950 population is about 57,000; however, it is estimated that the population connected with the sewers in 1943 probably will not exceed 13,000 people due to the "time-lag" between the completion of sewer construction and the actual joining-up of active service connections. It is estimated that in 1950 there may be about 44,000 people actually using the sewer system. In addition to the population connected to the sewer system, it is estimated that the industrial wastes emptying into the sewer system equal a population of at least 10,000 at the present time and will increase to at least 15,000 equivalent population by 1950. Therefore the plant was designed for an average daily rate of about 5.5 mgd and a maximum of about 7.7 mgd. Some of the units, however, are estimated to be adequate for the year 1970.

### The Sewerage System

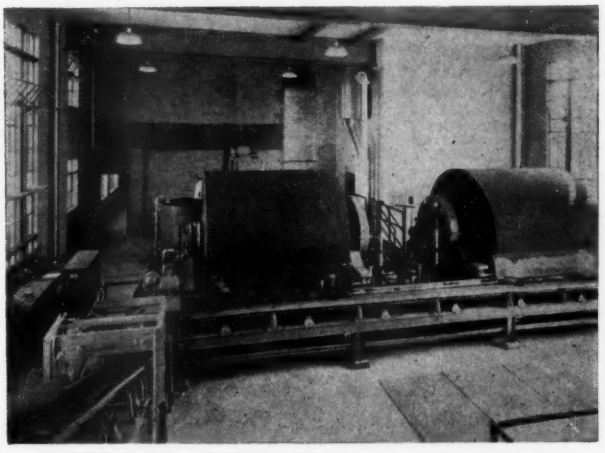
Three kinds of pipe were used in the sewerage sys-

# ...lant and Sewerage System

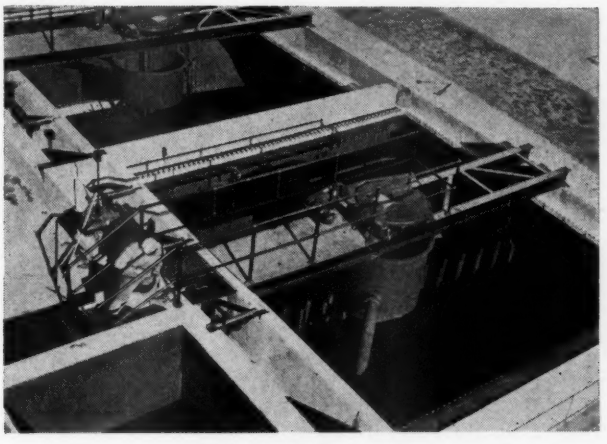
By RALPH W. HORNE
Partner, Fay, Spofford & Thorndike, Consulting Engineers



Electrical control desk and instrument panel in operating building.



Eimco vacuum filters for dewatering sludge.



Sludge elutriation tanks.

tem; namely, vitrified clay or shale pipe, reinforced concrete pipe and asbestos-cement pipe. Sewer pipe joints were specified to consist of caulked jute, slightly oiled for ease in caulking, and bituminous sewer jointing compound melted and poured in place. Making of the pipe joints received careful inspection and all pipe lines were tested for leakage. Repair of leaky joints was insisted upon wherever excessive leakage was found. As a result, tests of two separate stretches of completed sewer, including in one case 35 miles of tributary sewers ranging from 8-inch to 42-inch, and in another case 26 miles of tributary sewers ranging from 8-inch to 39-inch, showed respectively leakage rates of 7,500 gallons per mile per day and 5,500 gallons per mile per day. These tests were made during a period of reasonably low ground water conditions and we anticipate that for high ground water conditions, leakage might be about twice the figures stated.

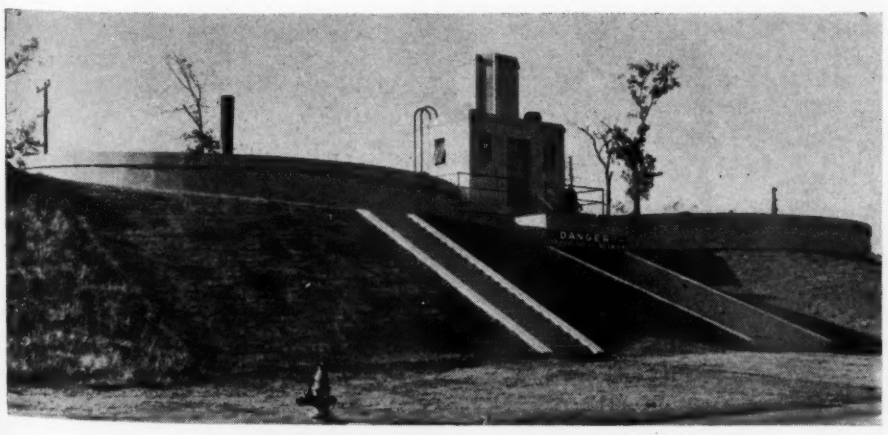
Three kinds of material were allowed by the specifications for use in force main sewers; namely, cast iron pipe, asbestos-cement pipe and reinforced concrete pressure pipe. All force mains to date have been constructed of asbestos-cement pipe, using Simplex asbestos-cement couplings with rubber rings for making the pipe joints.

## The Treatment Works

The accompanying plan shows the arrangement of the several units which comprise the treatment works.

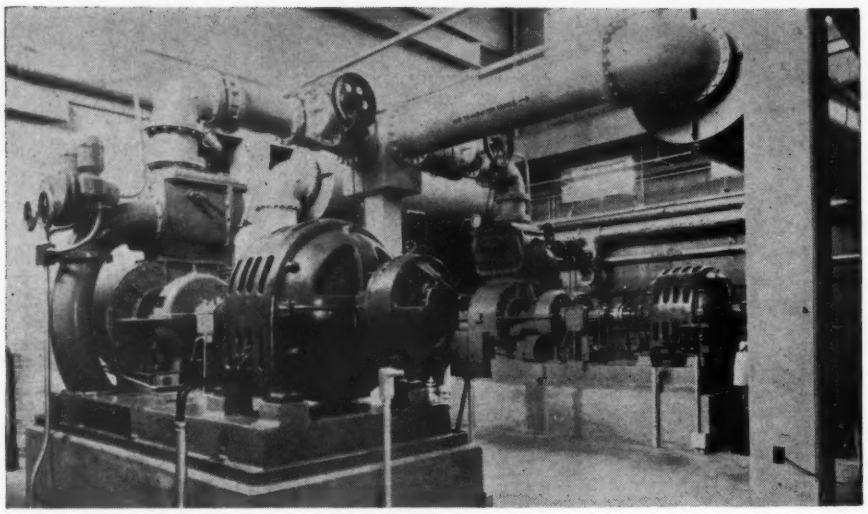
All sewage is delivered from the main sewage pumping station through about 3,000 feet of 24-inch force main sewer to the sewage treatment works.

*Grit Removal Unit.* Sewage first enters the grit removal unit where grit, heavy fruit seeds, coffee grounds, some brewery mash and other relatively



Sludge digestion tanks. Control room between them.


Entrance to sludge control rooms.



**Rotary blowers, which furnish compressed air for aeration tanks.**

heavy solids are separated from the liquids by sedimentation, and mechanically scraped into a sump at one side of the unit.

The mechanical equipment of the unit includes a Dorr revolving "detritor" 18 feet in diameter driven by electric motor, a reciprocating raking device and a propeller type pump. Grit and other solids are mechanically raked from the sump up an inclined cleaning channel and removed for disposal. Stagnant sewage in the cleaning channel is pumped back into the stream of incoming sewage.

A by-pass is provided around this unit.

The grit and other heavy solids which are collected in the grit removal unit are reasonably clean and disposal of this material is either by incineration in the plant incinerator or by dumping at an area adjacent to the plant, where much filling is desired to bring the ground surface to a suitable level.

*Comminution Unit.* The sewage next passes through a comminution unit, which consists of two channels, each about 5 feet wide and 5½ feet deep. In one channel there is installed a 25-inch "comminutor" mechanism and in the other channel, an inclined fixed bar screen with 1½-inch clear openings. The comminutor cuts and shreds the sewage solids, thereby reducing them to a size which will pass through ⅜-inch wide slots.

*Master Venturi Meter.* A master Venturi meter (Builders-Providence) measures all sewage which passes through the treatment works. The accurate capacity of the meter ranges from 1.5 mgd to 12 mgd. There is a connection whereby the sewage may be dosed with chlorine at the outlet end of the meter, just before entering the grease removal unit.

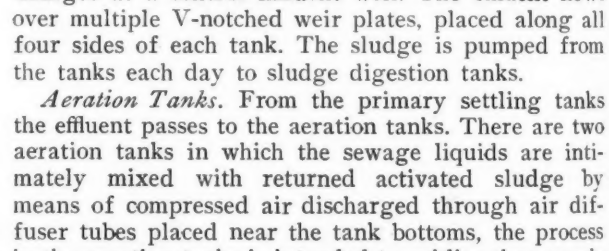
*Grease Removal Unit.* A single unit is provided for the removal of grease and fats from the sewage liquids. The unit consists of a concrete tank about 20 feet square with side-water depth of 10 feet 4 inches and a mechanical flotation device. Separation of greases and fats is accomplished by diffusing, over the bottom of the unit, finely divided air particles which, in rising upwards to the surface of the liquid, carry with them the particles of grease and fat.

Air is diffused in the grease removal unit by means of a mechanism manufactured by the American Well Works. This mechanism, or flotation device, includes a down-draft tube located in the center of the tank, equipped with a non-clog, screw type pump impeller which draws liquids from the surface level and also some atmospheric air, downward through the tube and forces it out across the tank bottom.

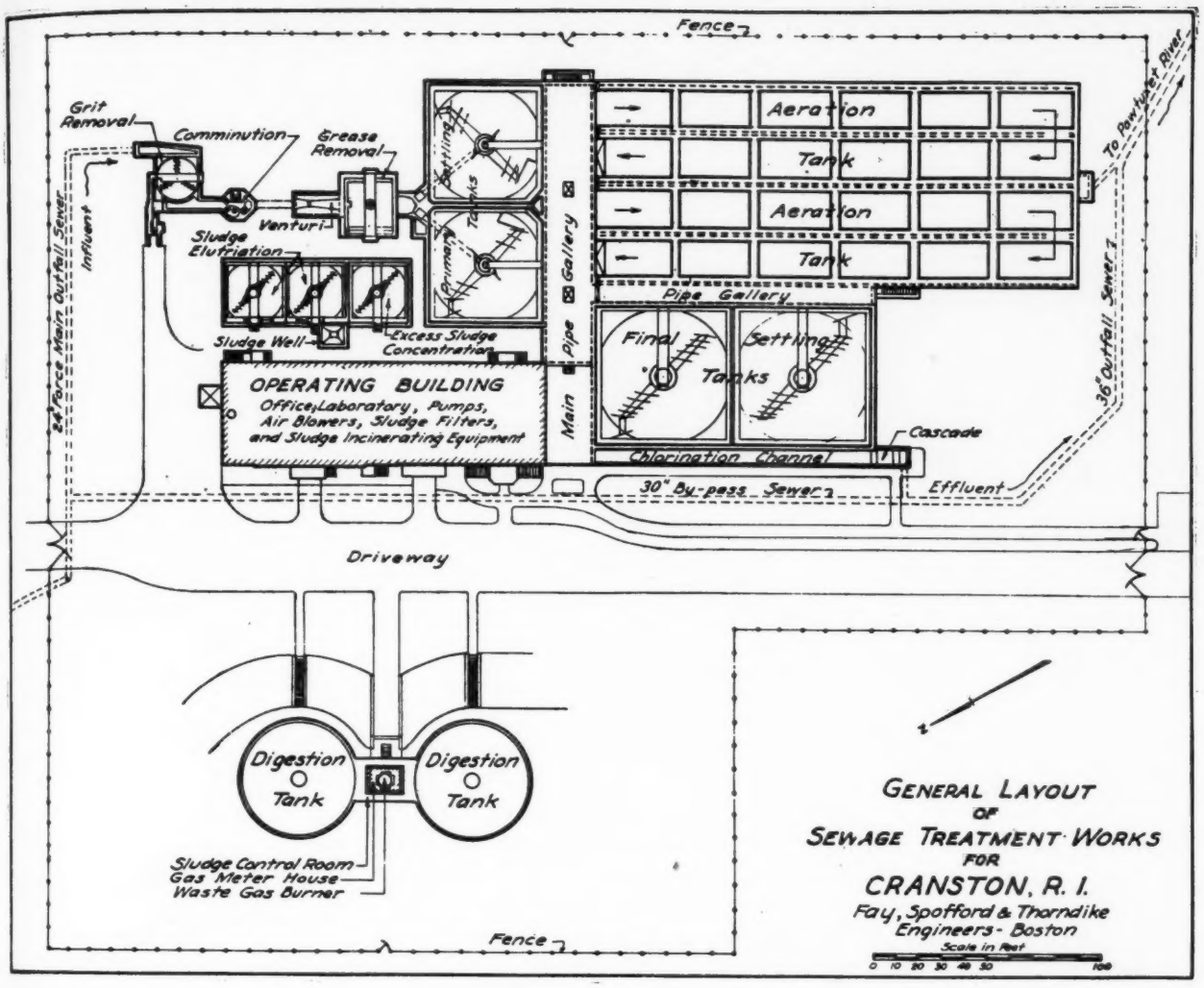
Grease which accumulates on the surface is drawn into troughs at both sides of the tanks by means of revolving spiral rubber squeegees. The separated grease is collected in a grease well whence it is pumped periodically to the sludge digestion tanks. General observations are that the use of chlorine has been beneficial in the removal of grease, although no definite figures are available. This unit may be bypassed, if desired.

*Primary Settling Tanks.* There are two primary settling tanks following the grease removal unit. Each tank is of concrete, 50 feet square, with side-water depth of 9 feet 1 inch and bottom sloping toward a central sump, the bottom slope being one inch per foot. The mechanical equipment of each tank is a revolving center drive clarifier with two bottom scraper arms and a skimmer arm at flow line level, furnished by the Dorr Co. Sewage enters the tanks at the bottom through a cast iron pipe which discharges at a central influent well. The effluent flows over multiple V-notched weir plates, placed along all four sides of each tank. The sludge is pumped from the tanks each day to sludge digestion tanks.

*Aeration Tanks.* From the primary settling tanks the effluent passes to the aeration tanks. There are two aeration tanks in which the sewage liquids are intimately mixed with returned activated sludge by means of compressed air discharged through air diffuser tubes placed near the tank bottoms, the process in the aeration tanks is intended to oxidize the organic material and to aid in clarifying the liquids. Each tank is about 210 feet long by 41 feet wide with side-water depth of 12 feet, the entire width being divided into two channels (or passes), each 20 feet wide, extending the full length of the tank, so that the total effective length of travel through each tank is approximately 420 feet, down one channel and back the other. Each tank is equipped with 338 air diffuser tubes, of tear drop shape, each 2 feet long. The tubes are of the fixed type, spaced for tapered aeration and connected into a cast iron header pipe; they are set in place with the thin edge of the tube upward. The primary tank effluent, the returned activated sludge and the air supply all enter the aeration tanks near one corner at the inlet end. The inflow to each tank is near the bottom of one of the longitudinal channels and



**Grit removal and comminution units.**




the effluent passes over a weir crest at the outlet end of the other channel.

*Air Blowers.* Compressed air for the aeration tanks is furnished by two Roots-Connersville rotary-type positive displacement blowers, each having maximum capacity of about 4,000 cubic feet per minute. Each blower has two sets of impellers to give flexibility of blower capacity. The two blowers together have a capacity range from 1,500 to 8,000 cubic feet of air per minute.

The air supply for the rotary blowers is filtered by two separate air filters; namely, a primary filter which is the automatic viscous type and a secondary filter which is of dry cellulose type. The filters are designed for a maximum flow of 8,000 cubic feet of air per minute and for a minimum flow of 1,300 cubic feet of air per minute. The filters are manufactured by American Air Filter Company, Inc.

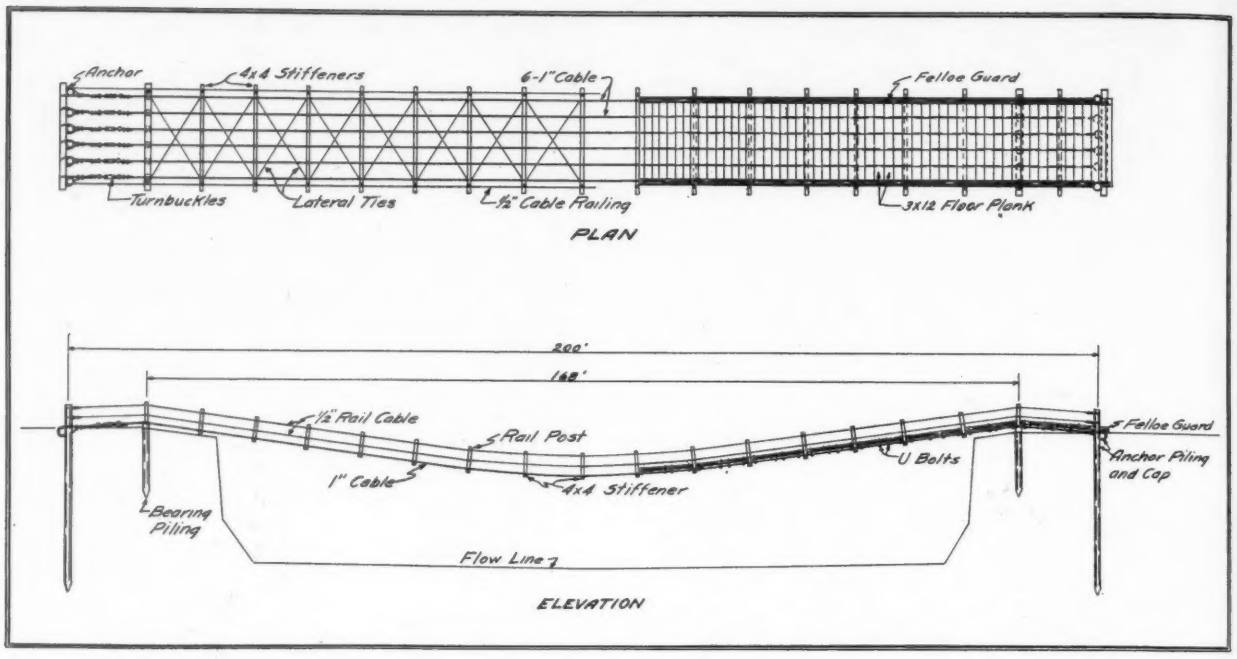
*Final Settling Tanks.* The effluent from the aeration tanks passes to final settling tanks which, by sedimentation, separate the organic solids from the effluent of the aeration tanks. There are two final settling tanks, each 60 feet square, with side-water depth of about 9 feet 10 inches, and bottom sloping toward a central sludge sump. The pitch of the tank bottoms is 2 inches per foot. Mechanical equipment of the tanks consists of Dorr revolving center-drive clarifiers with two bottom rake arms and scraper blades. Sewage enters the tanks through an influent trough discharging at flow line level at the center of the tanks: and the effluent flows over multiple V-notched weir plates placed along all four sides of the tanks. Sludge collected in these tanks supplies the return activated sludge for the aeration tanks. Sludge in excess of that needed for return activated sludge is thickened in a sludge concentration tank and then pumped to the sludge digestion tanks.

*Chlorination Channel.* The effluent from the final settling tanks flows through a chlorination channel, where it may be disinfected before passing from the treatment works into the outfall sewer, and thence to the Pawtuxet river. Provisions are made for applying liquid chlorine to the treatment works effluent at the upper end of the chlorination channel, which will afford about 10 minutes' period of contact for the average daily flow in the year 1950.

*Pipe Galleries.* The major piping which conveys the effluents between the primary settling tanks, aeration tanks, and final settling tanks, and also the compressed air piping, the return activated sludge piping and other miscellaneous piping is housed in two pipe galleries; a main pipe gallery approximately 162 feet long by 20 feet wide and 18 feet high, and a secondary pipe gallery, which is approximately 123 feet long by 8 feet wide by 16 feet high. The pipe in the galleries is all cast iron, most of it with bolted flanged joints but some with caulked lead joints.

*Sludge Concentration Tanks.* Excess activated sludge from the final settling tanks is thickened to reduce its moisture content in a sludge concentration tank. This tank is 26 feet square with side-water depth

*(Continued on page 40)*




# A Temporary Bridge To Minimize Use of Critical Materials

By R. A. RAWLINGS
County Engineer, Monona County, Iowa

**Flood destruction of two steel truss bridges, the impossibility of obtaining new trusses and necessity for the earliest possible replacement of at least one bridge, led to the construction of this swinging cable bridge.**

THE Soldier Valley drainage ditch drains approximately 180,000 acres in Crawford and Monona counties in Iowa. The land drained is mostly steep, hilly land with a very quick runoff, and during a heavy rainfall the ditch is subject to very rapid rise and carries a large amount of debris. At the present time the ditch has an average width of 150 feet and a depth of 25 feet with almost vertical banks which are subject to extreme caving.

In June of 1942, following an 8-inch rain in the upper Soldier Valley, two steel truss bridges, one east and one south of the town of Moorhead, were washed out and destroyed. Both of these bridges were within one-half mile of the town and were on the only roads leading into the town from a large trade territory and school district. With these two bridges gone, the nearest crossings of the Soldier Valley ditch were, one 3½ miles north and one 3½ miles south of the town, and it was imperative that some sort of structure be erected before the opening of school on the first of September.

As it was impossible to obtain a bridge of the size needed, it was necessary to erect some type of temporary structure with the materials available, and a swinging cable bridge was decided upon. Of the sites of the two bridges which had been lost, the lower was the more feasible for this type of structure. The stream here was narrower and it was on a local county high-

(*Continued on page* 46)

R. A. Rawlings. Temporary bridge in background.

***When you need special information—consult the classified* READER'S SERVICE DEPT., *pages 63-65***

Herbert
De Reuter

# Water Softening Increases Consumption at Oak Lawn, Ill.

By HERBERT DE REUTER
Superintendent of Water, Oak Lawn, Ill.

**Insufficiency of pump capacity caused by great increase in consumption due to softening met by rearrangement of existing pumps and piping.**

THE village of Oak Lawn, Ill., derives its water supply from deep wells, the first of which, 1900 ft. deep, was drilled in 1930. The water from this well contained too much salt, and in 1936 another was completed at a different location. This water also was unsatisfactory because of its iron content and 550 ppm of hardness, and in 1939 the village utilized WPA labor to construct the necessary building and install a zeolite water softener and iron removal plant, which was completed in April, 1940.

The response of the citizens to soft water was an increase in nine months from 483 consumers to 619.

During the summer of 1941 the demand for water exceeded the capacity of the softening equipment and it was necessary at times to pump from the well directly into the mains. After each direct pumping period it required two weeks of flushing from hydrants to get rid of the untreated water, which caused red iron deposits. We partially remedied this by constructing a bypass that permitted us to aerate and filter the water without softening it. But the citizens desired to have the water softened also.

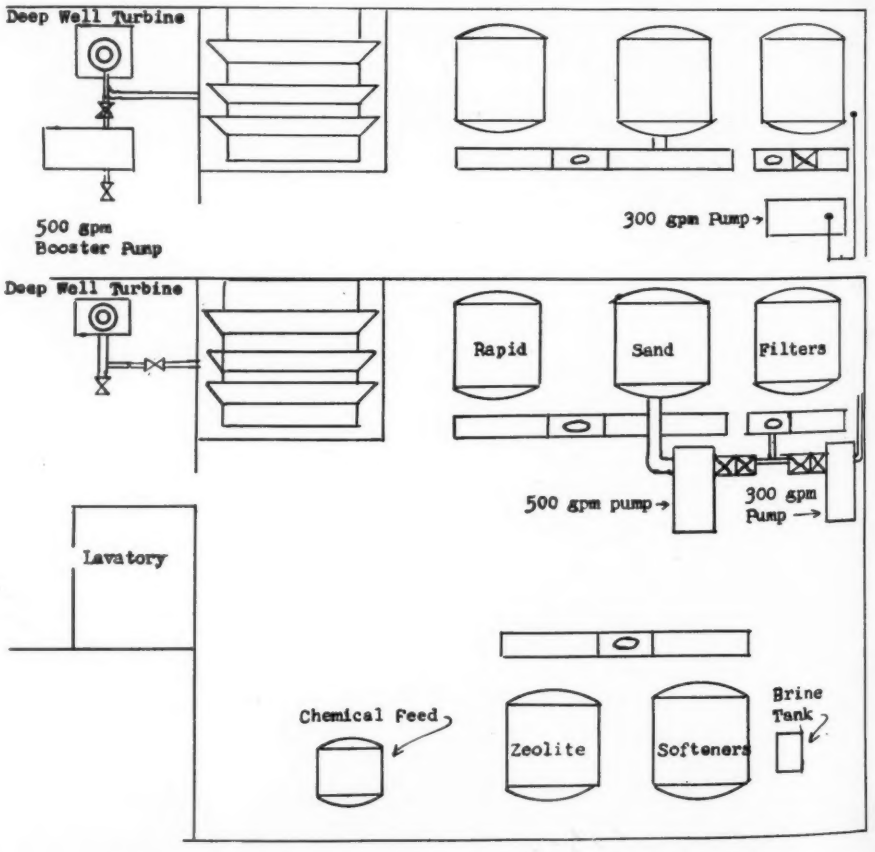
Engineers who were consulted advised that the deficiency was in the pump rather than in the softeners themselves. This pump had a capacity of 300 gpm but due to poor placement it was pumping only 200 gpm.

There was a 500 gpm booster pump connected to the deep-well pump discharge, which was idle when the deep-well pump was pumping over the aerator, and this was removed, and the deep-well pump connected to the main, with valves and bypasses permitting it to pump either direct to the mains or over the aerator. This 500 gpm pump was then available for reinforcing the 300 gpm.

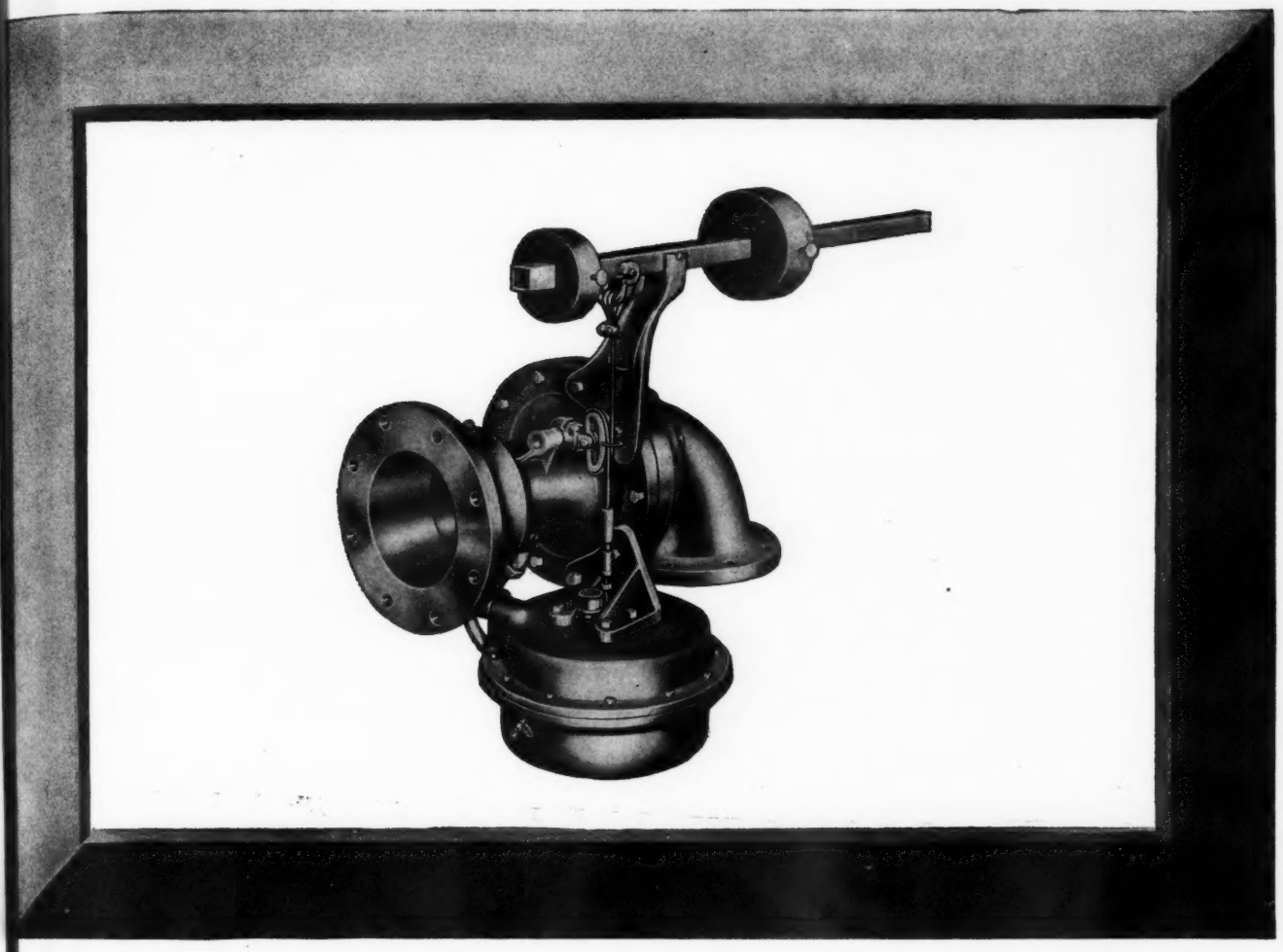
The position of the latter pump then was so changed as to shorten the suction line by 8 ft. and eliminate a 90° bend, which increased its output from 200 gpm to 240. The 500 gpm pump was then installed beside this pump, with the necessary gate and check valves, and throttled down to 400 gpm.

The result is very satisfactory. Our normal demand is 200,000 gpd rising to a summer sprinkling peak of 585,000 gpd. Under normal conditions the smaller pump operates 10 to 24 hr. a day, but if increased demand reduces the pressure below 48 lb. the larger pump automatically goes into service and the smaller one is cut out. Our customers now number almost 900 and we feel confident of our ability to supply them with soft water for the duration at least.

The work described was done by myself and a plumber (mostly after regular working hours) at a cost of less than a thousand dollars.




Oak Lawn water softening plant after improvement. Above—before moving the pump in 1940. The brine tank also was added at this time.



# *Portrait of* "A MIND AT EASE"

**Simplex "S" Controllers have established a reputation for long, dependable service that is taken for granted by thousands of design and operating men in plants all over the country.**

**We receive many comments from new as well as old users telling us of the steady, behind-the-scenes job our Controllers, Fluid Counterweights, and Clear Well Shut-Offs are doing to maintain peak efficiency for overburdened operating staffs in plants whose capacities are often being taxed to the very limit.**

**Certainly we are pleased, but not altogether surprised, since we know we have a fine line of control equipment, designed and proved as the right answer to your flow control problem.**

***The recently published Simplex Bulletin 250 gives clear-cut specification data that is worth filing for ready reference. Your copy will be sent immediately without obligation.***

**SIMPLEX VALVE & METER COMPANY**
**2750 UPLAND STREET, PHILADELPHIA, PENNA.**

*When writing, we will appreciate your mentioning* **PUBLIC WORKS**

Littleford Trail-o-Roller.

# Lubrication Makes Scarce Road Machinery Last Longer

NEVER before has maintenance of equipment been so important. For never before has it been so difficult to obtain new equipment or even repair parts, and therefore old equipment *must* be made to last out "the duration" if humanly possible.

Moreover, manpower also has been reduced to a minimum and, in the case of construction machines at least, adequate servicing will reduce the amount of repairs and other attention required—a case of the "stitch in time." In the case of water and sewage pumping and treatment plants, the prime necessity is continuous service, and only proper maintenance of all parts all the time will insure this.

Proper maintenance reduces repairs to a minimum, and with these eliminated it consists largely of lubrication, with occasional renewal of preventives of rust or other corrosion.

Lubrication problems and mediums are numerous, varying with the kind of equipment; so far as the public works field is concerned they may be classified for discussion under the general heads of construction machinery, pumping plants, and plants for treating sewage and water.

### Construction Machinery

Construction machinery is subjected to more severe duty than any other mechanical equipment. Not only must it endure heavy loads and shocks, but it is usually exposed to dust, mud, rain and snow, tending to cause rust, corrosion and abrasion. In such equipment practically every common mechanical motion is used—plain and anti-friction bearings; both open and enclosed spur, worm and herringbone gears; chain belts; wire ropes; and gasoline, diesel, steam and electric motor power.

An illustration of thorough, scientific maintenance of such equipment on a large scale is the construction of a naval supply depot in which 6,000 pieces of equipment were used, every one of which was serviced, greased and otherwise checked *at least once every 24 hours*—some oftener. At the end of the first shift each mobile machine was brought to the greasing shed, rough cleaned of excess dirt, mud and grease, then steam cleaned and washed down. The service men kept an eye open for repairs or adjustments needed and reported them to the greasing foreman for immediate correction.

Jaeger Screw Spreader being used to both spread and finish bituminous pavement.

The greasing done was thorough. Each machine had a lubricating log and every item on this must be checked off at each servicing. These include oil pressure gauges, oil-bath air cleaners, crank cases, oil breathers, clutch release bearings, spring trunnions; which were serviced at least once a day. Track-wheel systems were lubricated each shift. Clutch grease cups were given three complete turns each day, pressure gun fittings wiped clean and greased, and oil gravity cups serviced. Oil filters were cleaned and washed and fan hubs lubricated at every change of engine oil.

Once a week transmission oil filters were checked and serviced and transmission cases kept full; clutch compartments inspected and drained of excess oil; oil pan drains removed and cleaned, and distributor grease cups serviced. Batteries were inspected and distilled water added when needed.

Several kinds of lubricant were used for the different machine and various parts of each, for proper lubrication is possible only if the proper lubricants are used. Oil and grease were selected of such body and character as to lubricate all working parts for the temperature, pressure and other conditions to which they were to be subjected.

In connection with lubrication of road-building machinery, Standard Oil Co. says: "As a general rule,

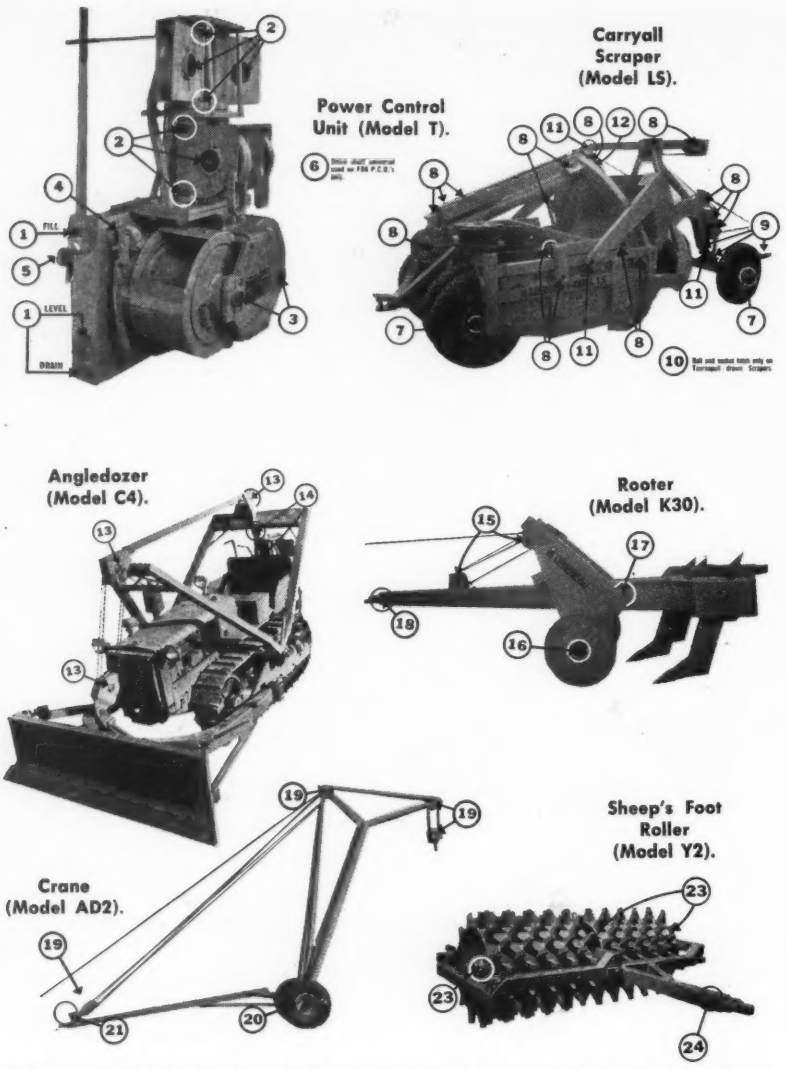
Galion Model 101 Motor Grader.


There are three forces constantly at work to destroy wire rope in use,—(1) wear, (2) fatigue and (3) corrosion. The use of LUBRIPLATE 130-AA as a wire rope lubricant has proven so effective in combatting them that rope manufacturers are recommending it for the toughest rope jobs.

LUBRIPLATE 130-AA has enormous film strength and adhesiveness. Hence it is not squeezed out under the terrific wire rope internal pressures. It is impervious to water, moisture and most industrial fumes. LUBRIPLATE therefore prevents rust and corrosion. By doing a better lubrication job LUBRIPLATE permits the strands and wire to work with minimum friction which materially reduces one of the causes of wire fatigue.


These claims for LUBRIPLATE are backed up by unsolicited testimonials of wire rope users who say that it has licked their wire rope problem. LUBRIPLATE lubricants range from the lightest oils to the heaviest greases. Each is an outstanding lubricant that will do a specific job better. Let us send you facts and figures about LUBRIPLATE lubricants. Write today.

**LUBRIPLATE DIVISION**
**FISKE BROTHERS REFINING COMPANY**
NEWARK, N. J. **SINCE 1870** TOLEDO, O.
WRITE FOR THE NAME OF THE DEALER NEAR YOU




***LUBRICATION POINTS***

***POWER CONTROL UNITS***

1. Gear case
2. Sheave bearings
3. Cable drum bearings
4. Brake roller shaft bearings
5. Brake rollers and control linkage
6. Drive shaft universal

***CARRYALL SCRAPERS***

7. Wheel bearings
8. Tailgate roller and sheave bearings
9. Universal forgings
10. Ball and socket hitch
11. Hinge pins
12. Spring pipe

***DOZERS***

13. Sheave bearings
14. Link bar pins

***ROOTERS***

15. Sheave bearings
16. Wheel bearings
17. Trunnion shaft
18. Universal forging

***CRANES***

19. Sheave bearings
20. Wheel bearings
21. Universal forging
22. Ball and socket hitch

***SHEEP'S FOOT ROLLERS***

23. Drum shaft bearings
24. Universal forging

**LeTourneau Lubrication Chart. Points to be lubricated are indicated by numbers on the chart and in the list of lubrication points. Frequency of lubrication and kinds of lubricant to be used are described on page 32.**

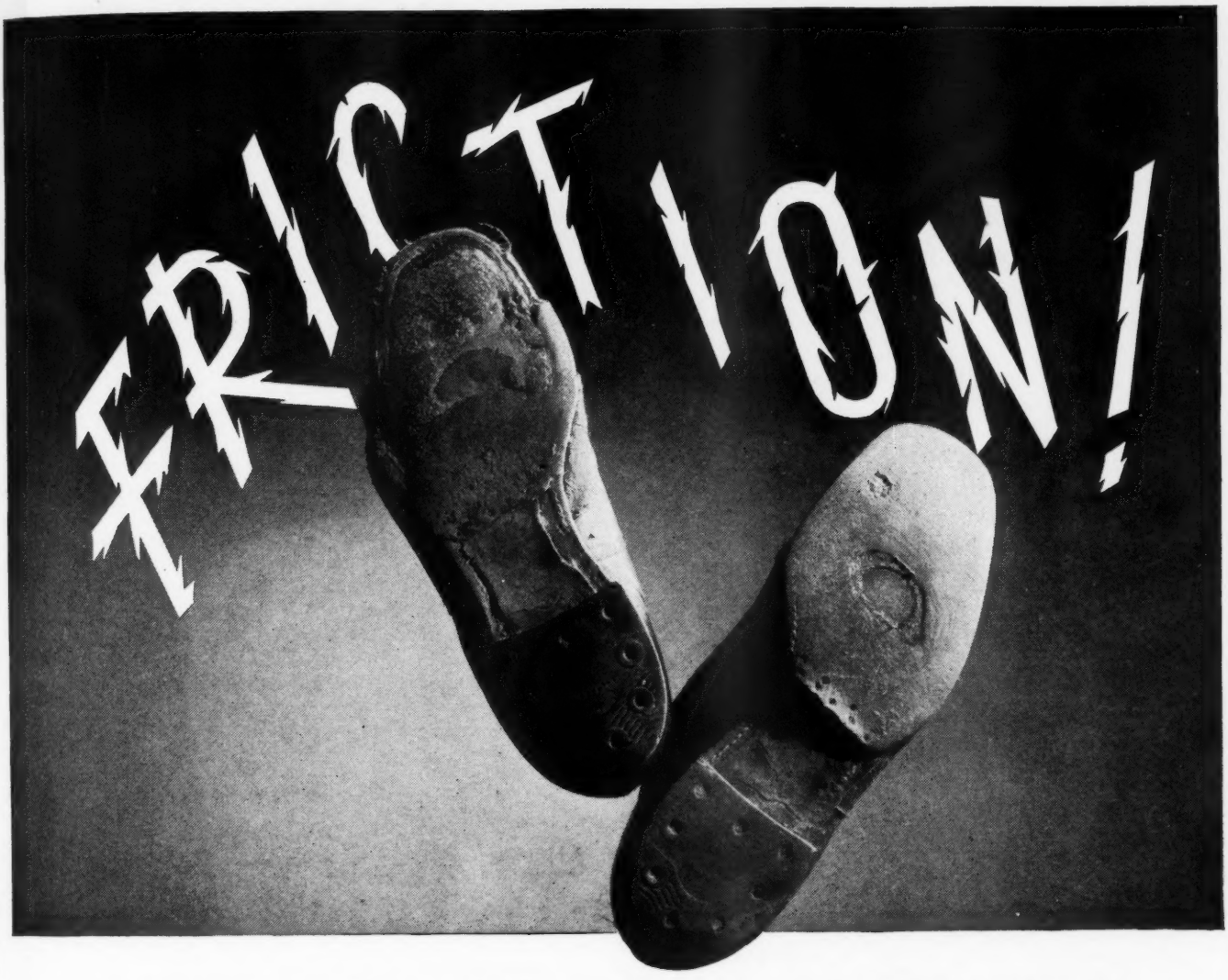
many of the moving parts must operate continually under extreme conditions of temperature, load, and speed, since nearly all road work is undertaken on contracts which specify completion of the job within a limited time. To avoid penalty for failing to meet deadlines, contractors apply the whip to their machinery. Although manufacturers have lessened the road builders' problems considerably by enclosing many of the moving parts and providing quick, easy methods of lubricant application, temperature extremes in winter and summer, plus the added hazards of mud, water, snow, and dirt, still put road building equipment under tremendous operating disadvantages. At the same time, road gangs handling the machines are frequently not lubrication-conscious, are apt to apply the wrong grade or type or none at all. Under these conditions, failures—with costly delays—may ensue. Good lubrication, however, will do much to prevent such failures and delays.

"To meet these widely varying conditions of operation and maintenance, and especially to combat an apparently constant attempt to make lubrication ineffective, the petroleum industry has had to provide numerous types of oils and greases.

*"Bearing lubrication.* While modern road building machines in general employ pressure gun fittings or some form of central oiling system for the bearings, many pieces of equipment depend upon compression grease cups or oil cups. The selection of lubricants for plain bearings depends not alone on the temperature conditions, speed, and bearing size, but also upon the possibility of dirt and water reaching the bearing surfaces. In cases where the journals support a high speed shaft, and if the bearing housing will retain it, a low viscosity oil is more suitable than a "medium" or "heavy" grade. . . .

"Ball and roller bearings are widely used on practically all of the new road building machines and to a lesser extent on many of the older ones. While such bearings usually are enclosed and thus, supposedly, are protected against dirt, water, and other contaminating influences, it cannot be assumed that the enclosures give perfect bearing protection. Moisture frequently penetrates and may corrode the balls or rollers and races. Where such possibilities for contamination occur, Essoleum Universal-wheel grease is more desirable than oil, not only because of its sealing properties but also because oil is likely to leak excessively. If oil is used where contamination is probable, it should have a considerably higher viscosity than that ordinarily indicated by the speed and temperature conditions. No oils or greases containing fillers, such as graphite or asbestos, should be used in ball or roller bearings, as the filler will bring about greatly increased wear.

*"Gear lubrication.* For various types of open gears, an adhesive lubricant should be employed so it will stick to the gear teeth regardless of rain, snow, heat




# REDUCE WEAR AND REMOVE CARBON WITH MACMILLAN RING-FREE MOTOR OIL

Undue motor wear, waste of fuel and excessive carbon have no place in a sound preventive maintenance program. At the same time, "production" must be speeded up. That's why operators simply must pay more than usual attention to motor lubrication ... and motor *cleanliness.*

Macmillan RING-FREE Motor Oil cuts down waste and wear while speeding up performance, and at the same time, RING-FREE removes carbon!

In 1094 Certified Road Tests, with various makes of owner-driven cars, 10 per cent increases in gasoline mileage were not uncommon after crankcases were drained and refilled with RING-FREE. As indicated by these tests, the average immediate saving was 1.3 miles per gallon! These tests emphasize that RING-FREE lubricates better ... *reduces friction faster.* It delivers direct to the drive shaft more of the horsepower ordinarily wasted in overcoming motor friction. It postpones "down-time" for repairs.

Macmillan RING-FREE Motor Oil combines all these qualities: great film strength, high heat resistance, long cling to metal, fast penetration ... *plus* the fact that it is non-corrosive, is less affected by dilution and it *removes carbon.*

## CARBON REMOVAL A NATURAL RING-FREE FUNCTION

Macmillan RING-FREE Motor Oil actually removes carbon while the motor runs! Hence, by its continued use, pistons, rings, valves—all vital parts—stay cleaner. Carbon removal is a natural function of RING-FREE, inherent in the crude oil and retained by the exclusive Macmillan patented refining process, *without the use of additives.*

*TO SUM UP: MACMILLAN RING-FREE gives more horsepower to the drive shaft—tangible saving of fuel—allows less wear on hard-to-replace engine parts—it removes carbon.*

**Macmillan Petroleum Corporation**

**50 W. 50th St., New York • 624 S. Michigan Ave., Chicago • 530 W. Sixth St., Los Angeles**



**MACMILLAN RING-FREE MOTOR OIL**

**REDUCES WEAR BY REDUCING FRICTION**

*When you need special information—consult the classified* **READER'S SERVICE DEPT.**, *pages 63-65*

**Austin-Western Grader with Bulldozer Attachment.**

or high speeds. The lubricant also must have the ability to sustain the load, resist hardening and cracking due to low temperatures, and not flow off the gear teeth at high temperatures. . . .

"Enclosed gears on road building machines nearly always are oil lubricated. . . .

*"Wire rope and cable.* Wire rope often has a hemp core which acts as reservoir for lubricant with which it is saturated when the cable is manufactured. A light oil or grease is generally used for hemp impregnation, and after being used for some time this is forced to the surface of the cable, leaving the hemp dry and in condition to absorb moisture which makes its way in from the outside of the cable. This moisture causes corrosion of the metal strands and disintegration of the hemp. Ordinary oil on the outside of wire rope or cable also loses its effectiveness under the action of dirt, grit, and water.

"Really effective external lubrication reduces frictional contact with the drum, sheave wheel, or pulley on which the cable operates. By protecting wire rope and cable on the outside by proper lubrication, water and dirt are prevented from making their way to the inside. At the same time an outside lubricant of the proper type not only helps retain the oil within the core, but has penetrating qualities so it makes its way to inner strands and the core. It also must resist being thrown off the rope at high speed. The problem of rope lubrication, therefore, is to obtain a product that will be light enough to penetrate to the core and yet heavy enough to adhere to the outside surface. . . ."

For earth handling, Le Tourneau makes carryall scrapers, angledozers, rooters, sheepsfoot rollers, cranes, etc. Their instructions for lubricating these are, briefly stated, as follows:

*Every 10 hours,* use chassis grease (medium or heavy) on sheave bearings of power control; tailgate roller bearings, universal forgings, ball and socket hitch and hinge pins of scrapers; on sheave bearings and link bar pins of dozers; on sheave bearings and universal forging of rooters; and on universal forging of sheepsfoot. Use light or medium chassis grease on ball bearings. (Where two weights of lubricant are named, use the heavier weight when the temperature is above 32° F.; either weight between 32° and 10°; and the lighter weight below 10°.

*Every 60 hours,* use engine oil (SAE 10) on brake rollers and control linkage of power control units; gear oil (SAE 90 or 140) on drive shaft universal; wheel bearing grease, medium, on wheel bearings of tractor-drawn scrapers and rooters, and on drum shaft bearings of sheepsfoot rollers; chassis grease (medium or heavy) on trunnion shaft of rooters, sheave bearings, universal forging and ball and socket hitch of cranes.

*Every 300 hours,* use gear oil (SAE 140) on spring pipe of scrapers; wheel bearing grease (medium) on wheel bearings of cranes.

*Every 900 hours,* use gear oil (SAE 80 or 90) on gear case of power control units, and

*Every 3,000 hours,* hand pack medium wheel bearing grease on bearings of cable drum and brake roller shaft of such units.

Lubricants are applied in some cases through hydraulic grease fittings, in others through button-head fittings, in others by hand packing.

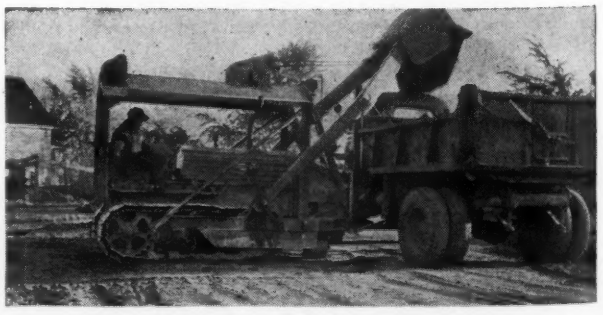
*"Lubricating equipment* need not be elaborate but should be sufficiently complete, and so arranged as to assure keeping all lubricants clean. Where only a few machines are maintained, hand-operated pressure guns may be more practical than air or electric powered guns. But for large fleets, air-powered equipment, mounted on a truck, is usually very profitable in time saved, convenience, portability and saving in lubricants.

"In lubricating through *hydraulic grease fittings,* insert new grease until a small amount of the old grease has been forced out, thereby forcing out any dirt that may have gotten into the bearings; being careful not to let any grease get on a clutch or brake surface.

"In lubricating through *button-head fittings* (used at points which require a considerable amount of lubricant) on universal forgings and ball-and-socket hitch, two or three shots of grease should be inserted with a pressure gun at the recommended intervals. On rooter trunnion shafts, insert new grease until a small amount of the old grease is forced out around the ends of the trunnion shaft. In wheel bearings, never use light-weight track roller lubricant. Where wheels have oil seals installed with leather cupped inward, toward the grease chamber, loosen the retainer plate to prevent the grease injected pushing the leather cup inside out, and pump grease until it comes out around the retainer plate. To lubricate the drum shaft bearings of a sheepsfoot roller, insert grease through the hub cap on each end of the drum, observing the precautions for leather cups as above.

"To *hand pack* a bearing, disassemble it, wash with gasoline or kerosene to remove old grease and dirt. Dip bearing in light-weight lubricating oil. Hand-pack with grease, forcing grease in between the rollers and spreading around both sides of the bearings, thereby covering the ends of the rollers with a seal of grease.

*"Gear cases.* When changing oil in a gear case,



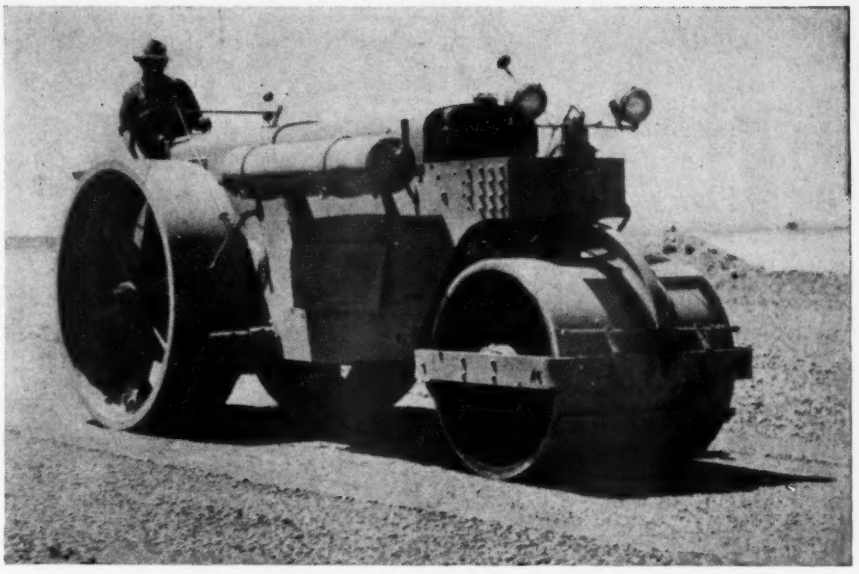
**Sargent overhead shovel on Cletrac tractor.**

always thoroughly flush the case and gears before refilling. The oil should be kept up to the level of the oil level plug, this being checked at the end of each operating shift.

"*Lubricants.* Use only high quality grease and oil; and keep them clean and free from dust and grit by proper storage and lubricating equipment. Always clean dirt and grease from grease fittings and plugs before checking or lubricating.

"For chassis grease, use a high-quality grease which can be applied with a conventional pressure grease gun.

"For wheel bearing grease, use short-fibre grease suitable for roller bearings and of a consistency suitable for application either with pressure grease or by hand packing.



**Model 101 Hercules Roller working on airport.**

"For engine oils, for use in gear cases, etc., use high-quality engine oils, following the engine manufacturer's instructions.

"For gears, use high-quality stable gear oils."

*Anti-friction bearings.* Fiske Brothers Refining Co., Lubriplate Division, says, relative to anti-friction bearings: "The type of housing provided determines whether an oil or grease-type lubricant should be used. . . . The essential functions which a ball or roller bearing lubricant—either oil or grease—should perform are: (1) Protect the surfaces of balls, rollers and races from rust and corrosion. (2) Assist in exclusion of dirt and water by forming a supplementary seal. (3) Prevent friction between balls, rollers and retainers.

"Grease is the accepted lubricant for most anti-friction bearings. With grease lubrication, maintenance work is reduced because there are no oil levels to maintain and addition of new lubricant is required less frequently. Grease in the right quantity is more easily confined in the bearing housing than oil. Grease effectively provides a secondary seal, thus protecting bearings against foreign matter. Regardless of all this, whether grease or oil, depends on speeds, operating conditions, and type of the bearing housing. Anti-friction bearings used in speed reducers, commonly known as enclosed gears, automotive transmissions, final drives and other similar assemblies, are usually lubricated with the same fluid type of lubricant as used for the gears.

"Of nearly equal importance to selection of lubricants for anti-friction bearings is the correct means of application and amount used. With oil, for example, an excess condition will result if bearings are oiled while the shaft is revolving. This is due to the action of the balls and retainer which pick up a considerable amount of oil; this sinks to a level when the unit is at rest, however, and overflow results. With grease lubrication, an excess supply must be guarded against. Too much grease applied to a bearing housing causes excessive churning on account of the balls or rollers having to run through a large amount of lubricant, particularly at high speeds. This churning results in the building up of temperature and otherwise is very destructive to the bearing. It is said that more anti-friction bearings are shortlived due to too much grease being applied than too little.

"To guard against excess lubrication, several manufacturers are now providing bearing housings with means of relieving over-lubrication. Motor bearings are commonly overlubricated, resulting not only in damage to the bearing, but excess of grease getting on the motor windings."

There are hundreds of lubricants on the market. Of one make alone—"Lubriplate"—14 lubricants are listed for contractor's equipment, and 16 for water works and sewerage plant machinery; and 7 "Texaco" lubricants are offered for pumps alone. Each is designed to serve one or more of several purposes—Reduce friction caused by two surfaces moving in relation to each other by maintaining a film of lubricant between them; dissipate the heat generated as a result of friction, and protect against corrosion. These it must perform when the parts are moving either slowly or at great speed, under extremes of temperature, in the presence of salt or fresh water, steam, etc.

Lubricants vary from a light oil to a heavy grease. A grease might be generally defined as a lubricating oil to which a soap of some kind has been added. In some cases one is practically necessary, in other cases the other; but where choice is practicable, the most common reason for selecting grease is that it demands less attention than oil, does not drip, usually withstands severe operating conditions better, and in many cases is more economical. Equipment parts commonly oiled are seal-type track roll bearings of tractors, crowd chains on shovels, and air compressors and air drills.

Concerning lubrication of the motor itself, Macmillan Petroleum Corp. quotes J. B. Macauley, chief engineer of the Chrysler Division, Chrysler Corp. as follows: "With regard to engine friction at 40 miles per hour, 50% of the horsepower developed by the engine is used in overcoming this loss." The importance of lubrication to keep this loss at a minimum is self-evident. The Macmillan Co. gives as important requirements for motor oil: film strength, to resist great pressure in thin films, at high temperature; cling quality, that will keep it on a vertical surface, even after days of idleness; and penetration of the oil to every point of friction. Excess of oil may lead to abnormal carbon deposits, particularly around the piston rings; although Macmillan claims that their "Ring-Free" oil prevents this.

# When the Whistles

## will your Plans for Improvements be ready?

**Preparedness for peace—complete, detailed plans for war-deferred water supply, gas and sewage works construction**

**—is a practical and patriotic contribution to the Nation's post-war welfare.**

* * *

**War demands have made it impossible to carry on normal improvements and extensions to these vital services. In some instances where construction could not be deferred, materials have been used which would not ordinarily be considered for permanent construction. Authorities estimate that more than a billion dollars of such improvements, extensions and replacements, necessary to public health and safety, has been deferred.**

**This reservoir of accumulated public works represents millions of man-hours of employment for returning soldiers and jobless war workers.**

* * *

**The time to prepare working plans and specifications for improvements, for extensions, and for replacement of temporary construction with permanent materials, is NOW, when engineering departments and consulting engineers are not rushed with work. Plans in readiness will save months of delay at a time when the transition from wartime to peacetime economy will be the Nation's number-one problem.**

* * *

**Any of the members of this Association will furnish promptly information and advice in the preparation of specifications taking full advantage of the greater economy and efficiency of cast iron pipe made in accordance with the new A. S. A. Law of Design*—pipe scientifically designed for your specific service requirements.**

*** Developed under the auspices of the American Standards Association in cooperation with the American Gas Association, American Water Works Association, New England Water Works Association, American Society for Testing Materials and the members of Cast Iron Pipe Research Association.**

*When you need special information—consult the classified* **READER'S SERVICE DEPT.**, *pages 63-65*

Walter Turner

# Precast Joints In Split Repair Sleeves

By WALTER TURNER
Superintendent Water Dept., Cambridge, O.

**To make possible more rapid repair of breaks in water mains, pre-poured joints are made in standard repair sleeves and need only caulking on the job.**

CAMBRIDGE, Ohio, is located in hilly country and its streets are carved out of the hillsides with many deep cuts and heavy fills. For obvious reasons we have more pipe line breaks than are experienced in level country. Our water mains are almost 100% cast iron, with lead for jointing material until recent months, when we began the use of less critical materials.

The majority of the breaks resulting from slips and settlements are square breaks, and split sleeves are most commonly used for repairing them. As all waterworks maintenance men know, every break is a special problem. The situation is usually complicated by unstable ground, wet trench, cave-ins, traffic hazards, interference of other underground structures, etc., in addition to the inconvenience of the shut-down of service in the vicinity. Speed in making the repair is therefore very desirable.

Manufacturers provide three types of sleeves. The cheapest is the solid sleeve, which requires cutting out the damaged piece, furnishing a short length of pipe as well as the sleeve, and pouring and caulking at least three joints. This is the most permanent repair but requires by far the longest shutdown.

The mechanical joint split sleeve, which is comparatively new, is the most costly and complicated but is claimed to be the easiest to apply.

The standard split sleeve with two poured joints is, in the writer's opinion, the most practical device for making repairs. The chief objection to it is the delay and inconvenience incidental to preparing and pouring two joints. To overcome this objection we have developed a procedure that we offer to other waterworks men.

Our plan is to precast the joints at the shop so that the sleeve may be applied immediately and expeditiously. We have had complete success with these precast lead joints on mains from 4″ to 8″ in diameter and with pressures up to 110 lb.

The photographs shown herewith illustrate the method of preparing a sleeve for an 8″ pipe.

View No. 1 shows the two halves of the sleeve, two strips of sheet iron to separate the lead, and a piece of scrap pipe to form the lead.

View No. 2 shows the parts assembled on a concrete floor with a clay dam at the bottom. The piece of pipe is centered in the sleeve and the sheet-iron parting strips are in position. These strips must be in good contact with the pipe to insure complete separation. The lead is poured over the edge of one of the strips so that both halves fill simultaneously.

View No. 3 shows the poured joint just as it looked on separation. The paper gaskets which we always use have been placed in position. The sleeve is now ready to bolt on the pipe over the break. The repair is then completed by caulking the lead. Caulking should

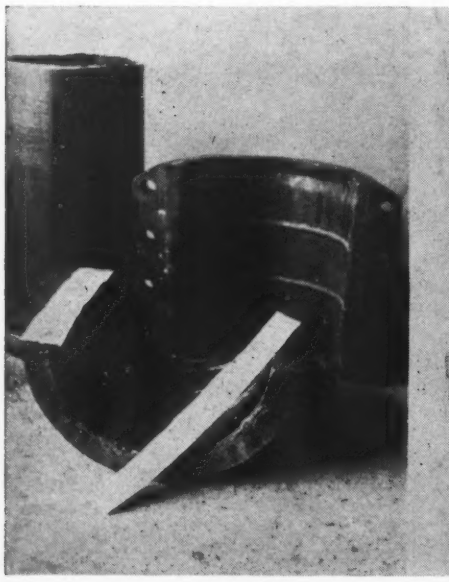


Fig. 1—The several parts ready for assembling.

Fig. 2—Part assembled, ready for pouring.

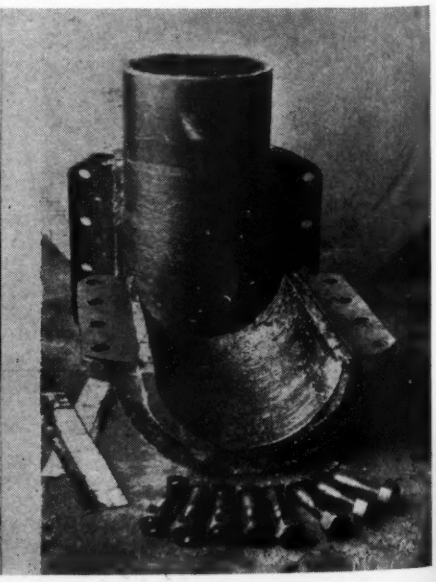


Fig. 3—Poured joint as it looks when separated.

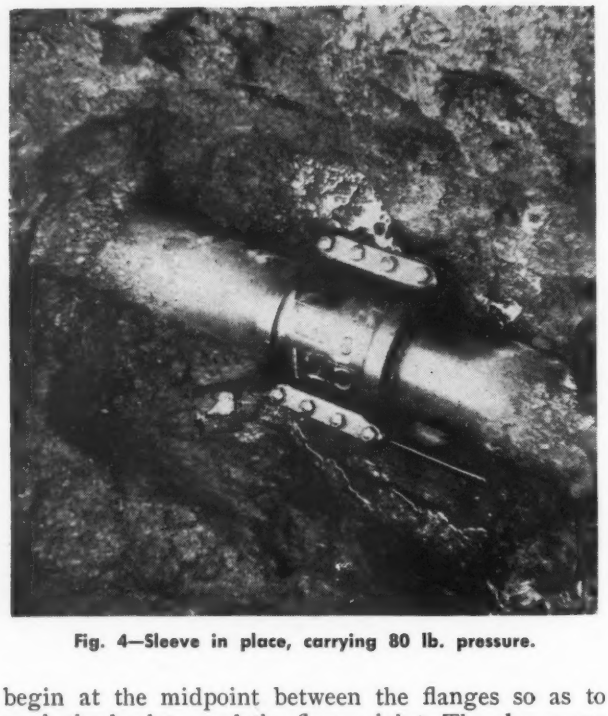


**Fig. 4—Sleeve in place, carrying 80 lb. pressure.**

begin at the midpoint between the flanges so as to work the lead toward the flange joint. The sleeve can be adjusted to slight variation of the pipe diameter or deflections at the break by using thicker or thinner gaskets.

View No. 4 shows the sleeve in place carrying 80 lbs. pressure.

Only a few minutes is required to apply such a sleeve. No time need be lost in an attempt to secure complete stoppage of flow when there is a leaky gate valve. Caulking can be done against pressure. For permanence it is surpassed only by the solid sleeve. It has only 8 nuts to tighten from two positions of the wrench. It uses the readily available lead instead of the critical material, rubber, used by the mechanical joints. The standard split sleeve will cover a lengthwise break of 11 inches.

The methods we have used to date in precasting the lead in split sleeves are the simplest possible. Some refinements will be added, such as wrapping the middle section of the pipe former so as to leave a bulge in the lead, to compensate for any misalignment of the broken pipe. Also, the bolts could be wedged in the holes of one section so that the two halves of the sleeve could be separated for placing by removing only the nuts, and the bolts in place would retain the paper gaskets. All of this would assist in shortening the time of making a repair of the kind described.

From the standpoint of national defense the arguments favor the standard sleeve if we consider machines and critical materials. In case of bombing attack on our cities, the precast split sleeve would be indispensable for quick repairs in a large percentage of the water main breaks.

We have already written a rather long story on a rather simple subject, but would like to suggest to manufacturers that they study the practicability of furnishing the precast joint in tapping valve sleeves as well as repair sleeves.

---

The fire department chimney at Grants Pass, Oregon burned out—while the department was out fighting a chimney fire.

---

# Suspending Seventeen Hundred Feet of Sewer from a Bridge

**A ten-inch corrugated pipe was used, set to a uniform grade by use of hangers specially designed for the purpose and of various lengths, and braced against wind loads.**

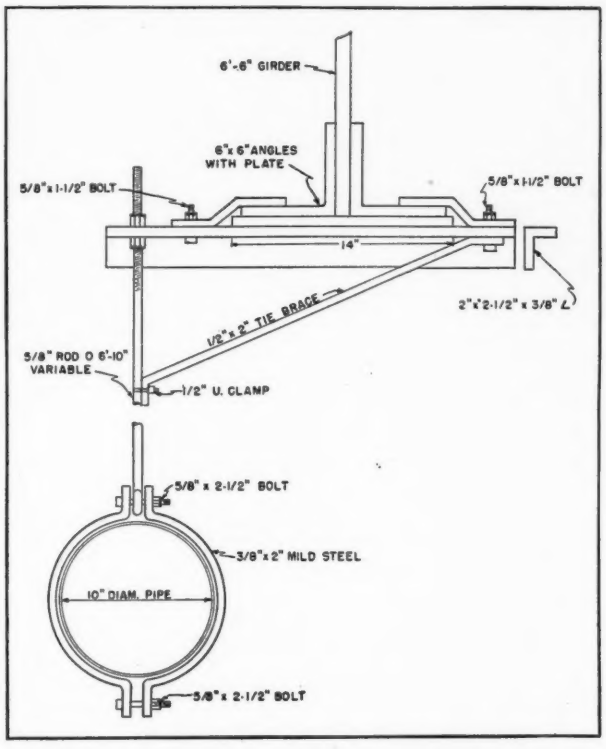
RECENTLY the Danville, Illinois, Sanitary District, with the assistance of the Work Projects Administration, extended the Danville sewer system into South Danville, which lies across the Vermilion river. To bring the South Danville sewage into the main trunk sewer it was necessary to cross the river, which lies about 100 ft. below the sewer grade.

Use of an inverted siphon for this crossing was considered, but it was believed that the flow would be insufficient to insure satisfactory operation. Alternatives were to cross the river in the stream bed and, at the farther bank, pump the sewage up to the trunk sewer; or carry a sewer on a gravity gradient, suspended from an existing railroad bridge.

The gravity line was decided upon after careful analysis of the factors involved, one of these being the fact that the discharge line from the South Danville sewer was adjacent to one end of the bridge and the main trunk sewer ran close to the other end. This bridge is 1700 ft. long, 120 ft. above the river, and consists of deck trusses over the river itself, with long plate girder deck trestle approaches.

The sewer was 10″ diameter, and Armco asbestos-bonded asphalt-coated corrugated pipe was used. This had several advantages for this use; being corrugated, it is able to absorb temperature changes in length without any special fittings; because of its light weight it could be handled in long lengths, and these could be coupled easily. The sewer had a uniform grade of 3.6 ft. per thousand; the bridge approach is on a down grade to the river and the river spans are level. It was necessary, therefore, to provide means for so attaching the pipe to the bridge structure as to permit of varying the distance between the pipe and the bridge deck. To effect this, a bracket was designed to be attached to the bottom of the deck girders without drilling holes in them; the sewer being suspended from the end of the horizontal bracket arm by means of vertical rods, threaded so as to permit accurate adjustment of length. Where the rods were long, horizontal ties were carried from the sewer to the bridge structure to take care of wind loads. Near the discharge end it was necessary to carry the pipe well out from the supporting girders, and here the ends of the brackets were additionally supported by steel cables connecting them with the top of the girder.

The pipe was fabricated in 24-foot lengths furnished with standard 12-inch wide corrugated coupling bands. These bands were placed with the opening on the top side and care was taken to see that the bands were fitted tightly. The bands and pipe were furnished with a double asphalt coating, and particular care was taken in the manufacture of the pipe to see that the sheets were correctly shaped and well riveted.




**End view of hanger for suspending pipe from bridge girder.**

Hangers were placed 12 feet apart, with one adjacent to each coupling band and one midway between joints. A fall of 3.6 feet per thousand was maintained in the pipe for the entire length of the bridge, and small elbows were placed in the pipe where changes in line were required by the varying width of the bridge or where necessary to clear the abutments.

Allan Hickman of Danville contracted for the installation and completed it in less than 14 days elapsed time. To install the pipe, he used a flat car pulled by a switch engine. The car supported a scaffold which was suspended from each end of the car by winches, and a small hand derrick, installed in the center of the car, handled the pipe. When the pipe was completed it was filled and tested for leakage. The cost of the complete installation was well inside the estimate.

J. E. Epler is manager of the Danville Sanitary District and has supervision of its operation and construction programs. Wm. M. Fairhall, formerly engineer for the district, was responsible for the design of this aerial sewer.

## Up-to-the-Minute Cranston Sewage Disposal Plant and Sewerage System

*(Continued from page 23)*

of 9 feet 10 inches and bottom sloping to a central sludge pocket. The bottom slope is one inch per foot. The tank is equipped with a Dorr revolving center-drive sludge thickener mechanism consisting of two bottom arms with steel blades arranged for moving the sludge on the tank bottom and scraping it into the sludge pocket. Each arm of the sludge thickener mechanism is equipped with vertical pickets which have their tops about 3 feet below flow line level of the tank.

Liquid effluent from the tank overflows multiple V-notched weir plates placed on all four sides of the tank and is mixed with the sewage liquids entering the primary settling tanks. Thickened sludge collected at the bottom of the tank in the sludge pocket is pumped to the sludge digestion tanks.

*Sludge Digestion Tanks.* There are two sludge digestion tanks, each 50 feet in diameter with effective side depth of 26 feet and effective center depth of 31.5 feet. The bottoms of the tanks slope toward the center at a pitch of about 2½ inches per foot. Each tank is equipped with a floating cover for collecting the gas produced. The tanks are heated by eight 4-inch lines of hot water piping placed around the inside perimeter of each tank.

Gas collected under the floating covers of the tanks is used for heating the tanks and operating building, for incineration of the sludge, or is burned as waste gas if in excess of the quantity needed. Gas production has averaged about 2.5 to 3 cu. ft. per capita per day.

Between the two sludge digestion tanks there is a building structure which comprises two sludge control rooms, one above the other, surmounted by a gas meter room and a waste gas burner. The sludge control rooms house piping and valves for controlling the flow of sludge into and out from the sludge digestion tanks and flow between the two tanks. One sludge control room also houses piping and valves for controlling the discharge of supernatant liquor from the tanks. Facilities are provided in one of the sludge control rooms for sampling sludge and supernatant liquor. The gas meter room houses facilities for measuring and controlling the flow of gas produced. Various provisions have been made to guard against gas explosion in either the gas meter room or the sludge control rooms. Excess gas is burned in the waste gas burner, which is enclosed by a chimney located on the roof of the gas meter room.

The sludge digestion tanks may be used either in series or parallel. For a limited period they were used in series and it is estimated that when operating in series there was about 10 per cent greater gas production than when operating singly. For the greater part of the time to date, however, only one sludge digestion tank has been used.

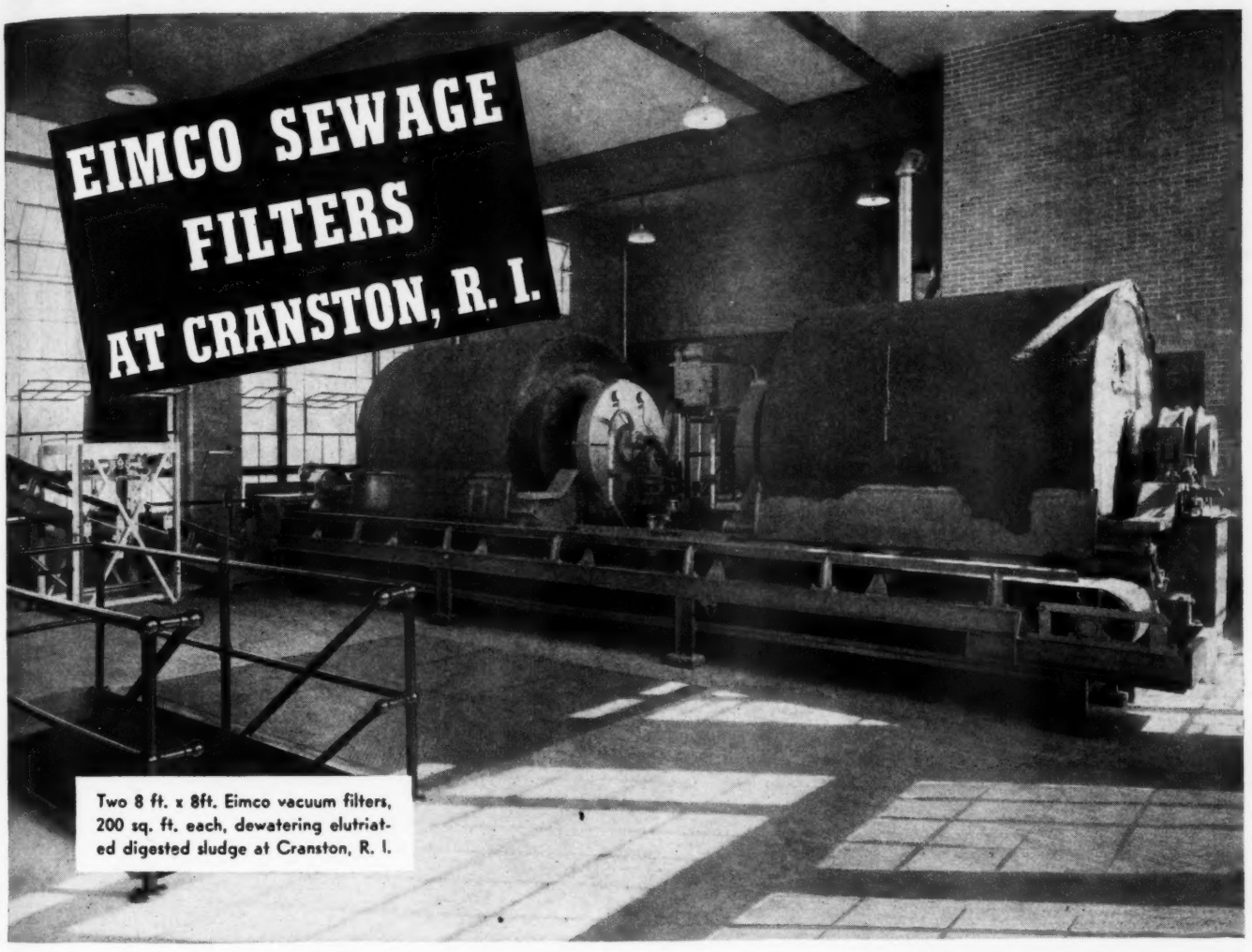
The supernatant liquor may be either elutriated and then returned to the primary settling tanks or may be returned directly to the primary settling tanks. To date, the supernatant liquor has been returned directly to the primary settling tanks.

*Sludge Elutriation Tanks.* The digested sludge is washed by means of a counter-current elutriation process in two elutriation tanks for the purpose of reducing the demand for ferric chloride to accomplish the best dewatering results from vacuum filtration. Upwards of 50 per cent saving in the use of ferric chloride is estimated to date from the elutriation process. Each sludge elutriation tank is of concrete, 26 feet square with side-water depth of about 10 to 11 feet, and sloping bottom, the bottom slopes being one inch per foot. Each tank is equipped with a revolving center drive sludge thickening mechanism similar to that used in the sludge concentration tank and each mechanism is fitted with bottom scrapers and vertical pickets. In the first elutriation tank the digested sludge is thoroughly washed by mixing it and stirring it with a clean water and elutriate (effluent from the second elutriation tank), while the sludge in the second elutriation tank is washed with clean water from the plant water supply, the proportion of clean water being about 3 parts water to one part sludge. The elutriation tanks are operated in series. The sludge is pumped from a sludge storage well to the first elutriation tank, where mixing with elutriate liquid from the second elutriation tank takes place in a mixing channel; thence the sludge flows through a pipe to a central influent well and into the tank. The effluent liquids from the elutriation tanks flow over multiple V-notched weir plates extending along three sides of each tank. Effluent liquids from the first elutriation tank are discharged into the sewage entering the primary settling tanks and again subjected to the sewage treatment process. The elutriated sludge collects at the bottom of the elutriation tanks. Elutriated sludge from the first tank is pumped to the second, emptying first into a mixing channel where it is stirred with entering clean water. The sludge is withdrawn from the second tank by gravity to a bucket elevator which raises it from the basement of the operating building to the first floor level where the vacuum filters are located. The sludge bucket elevator is enclosed in a concrete sludge well extending between the basement and the first floor level.

*Vacuum Filters for Sludge.* The sludge is discharged from the bucket elevator and delivered to a sludge mixing tank and agitator where liquid ferric chloride is added. The sludge mixture then passes to the vacuum filters.

There are two Eimco vacuum filters, of the rotary drum type, for dewatering the sludge by vacuum. Each filter consists of a drum about 8 feet in diameter by 8 feet long with effective filtering area of about 200 square feet. Just before one complete revolution of the sludge on the filter drum has taken place, the sludge cake is removed from the drum by means of air pressure and a discharge scraper. The sludge cake removed from the filter drops upon a belt conveyor and is carried over a Toledo Scale Co. continuous weighing apparatus, which indicates and records the weight of the sludge on a Builders-Providence apparatus. From the weighing apparatus the belt conveyor carries the sludge up an incline to the incinerator, or if desired delivers it into a hopper from which the sludge may be discharged directly into trucks outside the building. The filtrate liquids from the two vacuum filters eventually pass through the elutriation process.

*Sludge Incinerator.* The final step in treatment of the sewage sludge is accomplished by incineration, after which the resultant ash is disposed of for filling in the vicinity of the plant. The sludge incinerator is a Nichols-Herreshoff circular, multiple hearth type, having six hearths. It is about 14 feet outside diameter and about 18 feet in height. It is arranged to be fired either with sludge digestion gas or fuel oil. The ash is discharged by means of a bucket elevator and screw




Two 8 ft. x 8ft. Eimco vacuum filters, 200 sq. ft. each, dewatering elutriated digested sludge at Cranston, R. I.

**The newly completed Cranston R. I. sewage treatment plant was designed by Fay, Spofford and Thorndike, Consulting Engineers, Boston, Mass. The contractors were James A. Munroe & Sons, No. Attleboro, Mass. The plant is being operated by Superintendent Walter Brown, Jr.**

**Complete filtration equipment including filters, conveyors, sludge conditioning equipment and vacuum system were supplied by EIMCO. Detailed drawings showing piping, foundations, floor inserts and electrical connections were provided by EIMCO. Our engineers are specialists in this kind of work. Why not call upon them for assistance in preparing preliminary layouts and estimates for your future sewage filters?**

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conveyor into an elevated ash bin outside the building from which the ash is emptied by gravity into trucks for removal.

*Plant Water Supply.* An auxiliary water supply for the sludge elutriation process was obtained by construction of an infiltration gallery to develop a ground water supply. The infiltration gallery consists of two rows of 12-inch vitrified skip pipe in two-foot lengths. The plant water system includes the infiltration gallery, a water supply pump, a concrete storage reservoir of about 25,000 gallons capacity, a pneumatic water tank 6 feet diameter by 16 feet long, and a high-pressure water pump with air compressor and electrical control apparatus.

*Operating Building.* The operating building is approximately 45 feet wide and 143 feet long. The building in part consists of a basement and one-story superstructure, and in part, a basement and superstructure two stories high. The building has reinforced concrete foundation walls, with brick superstructure. The roof slab is reinforced concrete with tar and gravel roof covering.

The operating building houses an office and laboratory, together with the major items of mechanical equipment which are not installed outside in the individual treatment units. The equipment housed includes air blowers, vacuum filters, incinerator, chlorinator equipment, various pumps and an electrical control desk for operating the plant units. Control of the plant units, except those for digested sludge disposal, is centralized in the control desk. Special effort was made toward obtaining a compact arrangement of the plant units and as a result, practically every outside unit of the entire plant may be seen from the office, in which the control desk is located. The mechanisms of the outside units may be operated at the individual units as well as from the control desk.

*Remote Control.* The equipment for remote control of the several plant units is housed in a control desk approximately 15.75 feet long by 3.0 feet wide by 3.2 feet high. The desk carries the indicating and recording instruments on the incoming lines, the control switching and instruments for 4,000-volt air blower motors, and the control apparatus for 220-volt, 3-phase motors, together with certain pilot light and bell alarm circuits. Push-button stations on the control desk are generally semi-flush, with self-contained indicating lights mounted inside the control station push buttons. When the starting button is pushed and a unit goes into operation, the button shows a red light; the stop button shows a green light when the unit is not operating. Alarm bells are provided to warn of all abnormal operating conditions which might result in damage to an operating unit.

### Plant Operation

At the present time the average quantity of sewage treated is about 2 million gallons per day, including about 1¼ million gallons of industrial wastes. The reduction in B.O.D. is about 80 to 85 per cent and the reduction in suspended solids is about 85 per cent to 90 per cent. The amount of elutriated sludge filtered is about 60,000 gallons per month and the average moisture content is about 94 to 95 per cent. The rate of sludge filtration is about 3½ pounds of dry solids per square foot of effective filter area per hour. Digested sludge gas is used to fire the incin-

erator and fuel oil is used as a stand-by fuel. However, there has been only limited operation of the incinerator to date because considerable sludge cake is being used for fertilizing the grounds at the sewage treatment works and at the main pumping station; furthermore, a limited local market has developed for the sludge as fertilizer, and sludge cake from the vacuum filters has been sold at 30 cents per cubic yard.

The estimated annual cost of operating the sewage treatment works is about $29,000 per year, of which about $16,000 is for the operating force and the balance is for fuel, electricity, chemicals and miscellaneous tools, supplies and expenses.

The present operating force is ample to operate the plant when handling a much larger daily volume of sewage, and therefore the unit cost of operation is abnormally high at the present time.

### Construction, Progress and Costs

Construction started the middle of September, 1940, and the bulk of the work was practically finished in about 13 months.

The operating building, pipe galleries, aeration tanks, final settling tanks and sludge digestion tanks were built mostly on undisturbed natural material, while the primary settling tanks, grease removal tank, Venturi meter chamber, grit removal unit, and the sludge concentration and sludge elutriation tanks were built on filled material ranging from a few feet in depth at the primary settling tanks to about 18 feet in depth at the grit removal unit. The filling material was placed and compacted in layers by bulldozers with drag scrapers. All filling material was placed in the late fall and allowed to settle during the winter and spring before structures were built upon it during the following summer.

Construction of the sewage treatment works involved about 51,000 cu. yds. of excavation and the placing of about 7,500 cu. yds. of reinforced concrete.

The work was done under a lump sum contract of $658,000 and extra work amounted to about $7,200, making the total cost about $665,200.

Construction of the sewage treatment works was done under contract with James A. Munroe & Sons, of North Attleboro, Mass.

Engineering designs and engineering supervision for construction have been handled by Fay, Spofford & Thorndike of Boston.

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## Sewer Revenue Bonds Not Unconstitutional

The contract by a city to provide sewerage service in consideration of the payment of a connection charge did not, it was held, bind the city, by payment of such charge, to provide continuous service without further charge. And a statute permitting the city to issue bonds for a self-liquidating project was not thereby rendered unconstitutional as impairing the obligations of such contract. A suit against the city to cancel certain sewer revenue bonds issued by it and to enjoin the collection of such bonds and all charges against plaintiff and other taxpayers of the city for sewer service in connection with the sewerage system constructed from the proceeds of such bond issue was dismissed on the defendant's motion for failure to state a cause of action for which relief could be granted and for want of jurisdiction. Stevenson v. City of Bluefield, Federal District Court for southern West Virginia, 39 F. Supp., 462.

## Wartime Road Problems

There are two major wartime road responsibilities: to keep the traffic essential to the war effort moving, and to carry the existing roads through the war period in as good condition as possible. . . . The Highway Research Board believes that it can be helpful by aiding in disseminating in usable form the best available information on those phases of highway technology in which common practice has not become established or in which practice must be modified during the war. To this end a series of bulletins on "Wartime Road Problems" will be prepared by qualified committees and published by the Highway Research Board. Recommendations in this series of bulletins are based upon wartime restrictions and needs and are only intended for use as guides during the periods in which these conditions prevail.

Five of these bulletins have been published:

No. 1—Curing Concrete Pavements Under Wartime Restricitions on Critical Materials.

No. 2—Design of Highway Guards.

No. 3—Design of Concrete Pavements Requiring a Minimum of Steel.

No. 4—Maintenance Methods for Preventing and Correcting the Pumping Action of Concrete Pavement Slabs.

No. 5—Granular Stabilized Roads.

There are also in preparation:

Flexible Pavements.

Compaction of Soil.

Soil-Cement Stabilization.

Copies can be obtained from the Highway Research Board, 2101 Constitution Ave., Washington, D. C.

## The Construction of Tax Maps From Aerial Survey Plats

*(Continued from page 19)*

b. Transcribe the street and number in pencil on Form B under remarks.
c. Note variations between buildings on tracing and Warwick House Numbering Forms on Form D.

20. Print new lot areas on tracing in ink.
    a. Keep areas clear of buildings.
    b. Use template No. 100-C.
21. Draw on tracing in pencil, water, gas, and storm sewer lines.
    a. Ink the lines with No. 6 drawlet pen.
        (1). Broken line represents gas.
        (2). Solid line represents water.
22. Type Forms A & B.
23. Review operations 6b and 8c inserting date on each.
24. File tracing in numerical order in drawer entitled, "New Plats."

Each operation was typed on one side of a 5″ x 8″ index card. On the reverse side 185 numbered blocks were ruled for lettering by the particular draftsman completing that work.

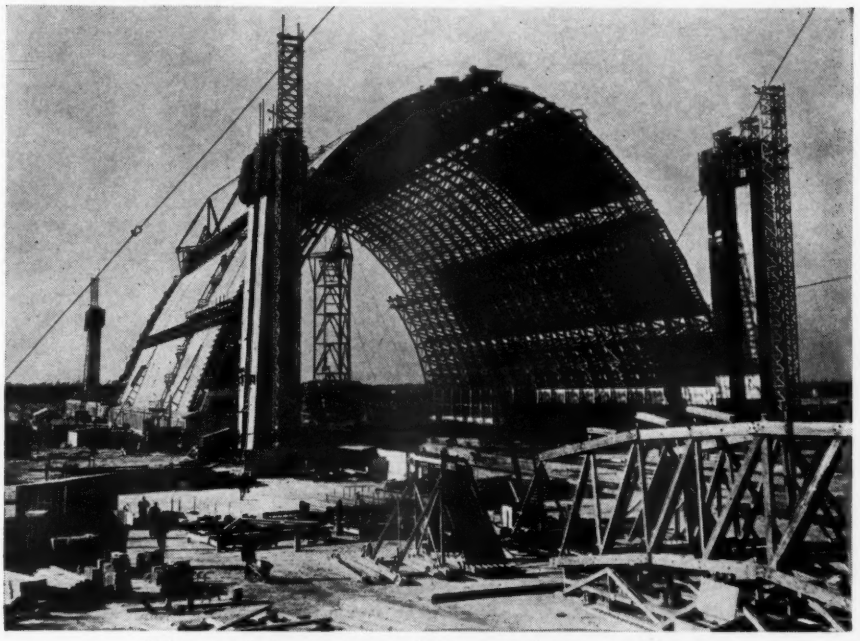
The first fourteen tracings thus processed were printed for the building inspector and other departments as outlined in the section of this article entitled, "Requirements." They are now being adapted to our tax assessors' records by their clerical staff and will be used for tax assessing purposes in June, 1943.

Delay has resulted from the war program. W.P.A. assistance is no longer available. Civilian Defense requirements have been a drain on our engineering office. Some of our personnel have taken enticing defense jobs. At the present time we have two city-employed draftsmen at work on the project.

Thirty-one additional tracings are now being prepared for printing. The remaining 140 are being completed in sectional lots of thirty or more.

# The World's Largest Timber Structure

The world's largest hangar for blimps is shown under construction in the illustration. Its arches rise 153 ft. with 237 ft. clear span, and the structure is 1,000 ft. long. It is the greatest timber structure ever erected, at any time in any place. It is being erected for the U. S. Navy "somewhere in the continental United States." Timber was selected for the structure in order to conserve steel, the saving of this amounting to 2050 tons. "Such a structure," said the War Production Board, "could not have been built of wood by ordinary methods without the use of timber connectors."



**The world's largest hangar being erected for navy blimps.**

All of the timber was pressure-treated with a mixture of ammonium and boron chemicals to make it flame-proof.

The War Production Board further said that use of these connectors "saved more than 400,000 tons of steel for essential war production in 1942. Towers, bridges, hangars, warehouses, and numerous other Government wartime construction requirements have been built of wood reinforced with timber connectors."



*When you need special information—consult the classified* READER'S SERVICE DEPT., *pages 63-65*

## A Temporary Bridge to Minimize Use of Critical Materials

*(Continued from page 24)*

way, whereas the other site was on a trunk highway and a permanent structure should be erected there first whenever it was available.

At the site chosen, the ditch was 142 feet wide. Six 30-foot anchor piles were driven on each bank, approximately 29 feet from the bank and 200 feet from center to center. The two outside piles were left 3½ feet higher than the four center piles, to anchor the bridge railing. On the back side of the six piles a 10″ x 10″ x 20 ft. timber was bolted, with the top of the timber flush with the tops of the four inner piles. For bearing piles, shorter piles were used, so as not to disturb the bank more than necessary and cause caving. For each bearing, six 12-foot piles were driven 16 feet inside of the anchor piling. This left 168 feet of clear span between the supports. A 10″ x 10″ x 20 ft. timber was used for a cap on the top of these piles, and at 3-foot centers, six steel saddles were bolted to carry the floor cables.

For stringer, six lines of 1″ cable, with 43 tons breaking strength, were used. At each end, each cable was wrapped around one pile and around the timber back of the pile, so that any extreme load was supported by all six anchor piles. Between the anchor piling and the bearing at one end of the bridge, a 1½″ turnbuckle was placed in each cable so as to adjust the tension on the cables uniformly.

In order to stiffen the structure and prevent side sway, 4″ x 4″ x 16 ft. stiffeners were hung below and at right angles to the 1″ cables at 10-foot intervals. Each stiffener was fastened to each cable with a U bolt, and lateral ties of double No. 9 wire were tightened diagonally between each pair of stiffeners. In actual use after completion, it was found that side sway had been entirely eliminated.

The floor system consists of 3″ x 12″ x 16 ft. plank laid transversely on the supporting cables. A felloe guard of 4 x 4 timbers, cut to five feet lengths and fastened to the outside cables by means of U bolts, is also used to hold the floor plank in place. After the felloe guard had been fastened in place, the floor plank were spiked to it from the under side. This floor system has a weight of approximately 12 tons, which seems to counterbalance the weight of heavy loads and reduces the vertical swaying of the floor to a minimum.

To build the railings, 4 x 4 timbers were cut to 3 ft. 6 in. lengths and fastened at the base to the stiffeners by means of strap irons. Two strands of ½″ cable were attached to the outside anchor piles and strung through these 4 x 4 posts.

The bridge was completed in August, 1942, and has proven to be very satisfactory. Traffic has been extremely heavy, consisting of every type of vehicle from team and wagon to loaded trucks and tractors. The

**View of completed bridge.**

total cost of the structure was $2,040.65 and practically all of the materials used can be salvaged. The savings made in vehicular mileage have already far exceeded the cost of the bridge at a time when mileage savings are a necessity.

## High Nitrate Content in Biologically Purified Sewage

The time-honored concept that a high-nitrate content was indicative of good sewage purification has recently been questioned. In the activated sludge process it has been observed that an exceptionally clear effluent can be procured that contains little nitrate. Mohlman considers this effluent completely satisfactory. Halvorson points out that his highrate trickling filter also produces little nitrate. He proves that nitrates in the trickling-filter effluent are formed from sludge which, upon too little rinsing action, are retained in the filter and are there oxidized (Taschenbuch der Stadtentwasserung 1939, 75, 76, 118, and 145.)

Nitrates are the end product in the decomposition of nitrogen-containing sewage. They are salts easily soluble in water. It is wrong to conclude that the more nitrates present in the effluent the better the action of the sewage-treatment plant. Nitrates are not essential in an effluent. They are of little use as oxygen carriers since their action starts only after all of the soluble oxygen has been used. As nitrogen fertilizers they are burdensome since they cause excessive weed growth in rivers and lakes. For agricultural purposes it is more advantageous to leave nitrogen in a combined form in the sludge. This proves that there is no advantage in having nitrates present in the sludge.

It is important to know where in the various biological processes nitrates are formed and how it is possible to prevent their formation without impairing the effluent. Naturally, the effluent must not contain more nitrogen in other forms, i. e., as ammonia or organic gases, but it must be brought into the sludge as complete as possible. The effluent of a field irrigated with sewage or of an artificial biological plant in many cases contains more nitrates the further the decomposition is carried and hence the longer the effluent remains in the ground or in the plant. This is due to better aeration.

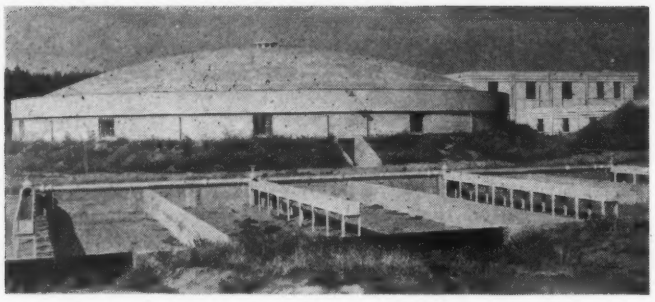
In irrigational fields unnecessary nitrate formation is prevented by previously purifying the effluent as well as possible; thus a large part of the nitrogen is retained in the sludge. Settling tanks serve this purpose and, better yet, effect biological purification.

In trickling filters, nitrates enter the effluent only when previous purification is poor. The new high-duty trickling filters prevent these disadvantages by washing of the sludge, settling it, and obtaining sludge fertilizer.

In the activated-sludge process nitrates appear when the amount of sludge in the aeration beds is too large or the flowing-through time is too long. By regulating the amount of returned sludge and the aeration time, clear effluent can be obtained which requires as little oxygen as possible and contains a very small amount of nitrates.

This shows that the new technical improvements in irrigational fields, trickling filters, and the activated-sludge process involuntarily decrease the nitrogen contents of the effluent.

Abstract of a paper by Karl Imhoff in "Gesundheits-Ingenieur". From "Public Health Engineering Abstracts."



**Brainerd sewage treatment plant. Concrete dome covers filter. Hitchcock & Estabrook, engineers.**

# The Sewerage Digest

**Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.**

## Biofiltration For an Army Camp

An army cantonment in California obtains its water supply from 5 deep wells about 6 miles from the ocean and near a river. In summer, surface flow of the river ceases. The sewage effluent is discharged into this river about 2 miles below the nearest well, and in summer sinks into the river bed, up stream from an underground dam or barrier built to prevent infiltration of ocean water. The effluent therefore receives a high degree of treatment. The method adopted is two-stage biofiltration, chlorination of the final effluent followed by oxidation, and two-stage sludge digestion. During the first ten months of operation, operating at 50% of the design capacity, results consistently showed a five-day B.O.D. reduction above 95%.

The plant is divided into two duplicate parts, all major units being so arranged that either half can be used as the first stage. Either half of the plant or both in parallel may be used for single-stage treatment; either filter can be held out of service; either sedimentation basin can be used independently, or both used together in series or parallel. Constant-velocity grit chambers were designed for ½ ft. per sec., but after operation this was changed to approximately 1 ft. Retention period in the sedimentation basins, based on a recirculation ratio of 1:1, is 6.11 hr. The biofilters have a rating of 6.78 mgd, or 32,700 persons per acre-foot. The digesters have a combined capacity of 3.94 cu. ft. per capita. Sludge beds have a total area of 4.6 sq. ft. per capita; they are in sandy soil without underdrains. Chlorine can be applied at the influent of each sedimentation basin, influent to each filter, returned supernatant, and plant effluent. The chlorinated effluent is spread on oxidation ponds covering about 10 acres.[L3]

## Sewage Plant Without Critical Materials

The author describes a project to serve new war housing developments in a crowded defense area located on tidal waters, comprising preliminary treatment and chlorination. For 36″ to 60″ trunk sewers, bids were received on monolithic concrete, cradled segmental tile, and unreinforced concrete pipe with a concrete cradle. The last was adopted. Instead of iron manhole steps, vitrified clay blocks with toe pocket and hand hole were bonded in the brickwork. Each pump was set in a dry pit of unreinforced concrete sunk as a caisson, and the connection with the trunk sewer was provided with a wood stop gate and a wood slat screen; no check valves are used. A Parshall flume will measure the sewage flow.

Two plans for sedimentation tanks were selected, one of the Imhoff type, the other a shallow rectangular tank with sludge removing equipment. The former comprises a series of unreinforced concrete cylinders sunk as caissons, with flowing-through compartments of wood joining the several units; an objection is the cost and difficulty imposed by the 40 ft. depth. The shallow tanks are planned with unreinforced gravity section concrete walls, and the floor also is unreinforced as it is above ground water level. Digestion tanks are designed round, either sunk below ground level as a caisson, or largely above ground with gravity section walls. To eliminate heating coils, the sludge may be heated by direct steam application.

For the 48″ outfall sewer extending 1700 ft. into tidal water and 33 ft. deep at the outlet, concrete pipe was selected, reinforced with a single elliptical cage of steel.[C20]

## Estimating Urban Runoff

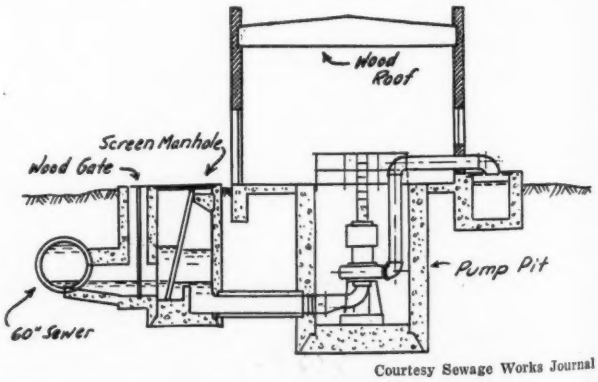
This paper presents and analyzes the results of hydraulic investigations and rainfall-runoff gaugings for improved urban drainage areas of different sizes and types of development, and develops hydrographs and methods of computing runoff; based largely on Los Angeles, Calif., data. It discusses rainfall records, storm patterns, antecedent precipitation, soil infiltration tests, construction of hydrographs. Among the conclusions are:

The peak runoff rate for a given storm pattern is proportional to the volume of runoff resulting from the intense portion of the storm. It may be predicted by infiltration tests on small soil plots and by analyses of rainfall-runoff records from partly or fully pervious or impervious areas.

Records in which high rainfall intensities occurred near the end of the storm disclose hydraulic phenomena and time relations which, when secured from drainage areas of various sizes and physical characteristics, permit prediction of the approximate intensity and pattern of the runoff hydrograph that will occur under selected conditions of drainage area and rainfall. For urban areas in Los Angeles and St. Louis, the records showed actual runoff rates agreeing with those computed by this method within a 20% tolerance.[K8]

## Sewage Gas Profitable at Fort Dodge

The Fort Dodge, Ia., sewage plant treats the sewage of 22,000 population and packing house wastes equivalent to 51,000 more. Two-stage digestion giving 12 to 15 days in each digester yields an average of about 110,000 cu. ft. of gas per day, which is used in a 6-cylinder, 11½ x 13½, four-cycle Cooper-Bessemer gas engine, which drives a 175 kw, 3-phase, 60-cycle, 2400 volt generator. During the fiscal year 1941-42 it ran 95.6% of the time and generated 1,194,800 kwh, of which the sewage plant consumed 509,700 kwh and sold to a private electrical utility 685,000. In four years of operation the plant has not had a single breakdown. Hydrogen sulfide is removed from




Courtesy Sewage Works Journal

**Cross-section of pump pit and sewer connection minimizing use of critical material.**

# The Forehearth

*A forehearth in one of our foundries — drawn by Hugh Ferris*

**Molten iron is pouring from the forehearth into a ladle which will be picked up by a crane hook and carried to a Super-de Lavaud centrifugal casting machine. All raw materials in the melt have been inspected and laboratory-checked. The analysis, predetermined. Then, as a further precaution, to insure uniformity of both analysis and temperatures in cupola operation, the molten metal is accumulated and mixed in 12-ton reservoirs called *forehearths*. Variations in speed of melting, iron composition and temperature are thereby reduced to a minimum. This is one of a series of controls in operation at each of our plants, beginning with inspection and analysis of raw materials and ending with tests of the finished cast iron pipe.**

## UNITED STATES PIPE & FOUNDRY CO.

**General Offices: Burlington, New Jersey.** ***Plants and Sales Offices throughout the U. S. A.***

the gas by an iron sponge purifier, which reduces it from 400 grains per 100 cu. ft. to less than 25 grains at a cost of $442.50 a year. No extra labor is employed for gas production, but it is charged on the books with 640 man-hours of superintendence and 280 of maintenance, or a cost of $483. Lubricating oil cost $162.64. The total production cost for the year was 1.13 mills per kwh, or 1.8 mills if 5% depreciation be added. The surplus current is sold for 8.5 mills, which would be the price paid for current by the plant. Thus the gas engine saves the city $8,800 a year—sufficient to pay for the power plant in two years.[H21]

### Wooden Imhoff Tanks

Nine Imhoff tanks with a capacity of 3.8 mgd have been built at a cantonment, entirely of wood except the unreinforced concrete bottoms, thus using no critical materials except spikes. All lumber was long leaf pine painted with one coat of creosote conforming to federal specification PT-W-561A, which is believed to give it a structural life period of five years. Each tank is 15 ft. x 75 ft. by 24.5 ft. deep. Sluice gates, channels, vertical and horizontal sludge pipes, all are of wood. Vertical uplift is avoided by setting them half out of the ground, surrounded by embankment to withstand outward pressure, and strutted to withstand inward pressure. Time also was saved by timber construction, as it would have taken as long or longer to build forms for a concrete structure than it did to built it of timber.[E7]

### Health Departments And the War

The New York State Division of Sanitation finds that the war has brought to it additional duties to be carried on by a diminished staff. Nearly half the time has been occupied in developing the mutual aid program for water service. Additional functions include studies of industrial waste problems in connection with war plants; passing upon plans for water supply and sewage and waste disposal for war industries, military and naval establishments and housing projects; giving sanitary engineering assistance to military authorities; assisting in sterilizing new mains; survey of water supplies with reference to their protection against sabotage; investigating projects submitted under the Lanthaw Act; and control of sanitation around military and naval establishments during and after construction. This has necessitated curtailing the customary routine supervision over the operation of water and sewage treatment plants.[C21]

Illinois finds the great increase in alcohol-producing industries presents a problem because of the practical impossibility of obtaining materials for waste treatment. Increased numbers of cheese making plants and food canneries create wastes that upset treatment works in small communities and make it difficult to prevent gross pollution of streams.[C22]

### Flotation Sewage Treatment

Sewage flotation removes suspended and colloidal solids from sewage by buoying them to the surface by means of air bubbles to which the solids attach themselves, forming a froth composed of air bubbles, solids and a small amount of liquid. To facilitate this action, a flotation reagent is added. Twenty such reagents, which are used for mineral separation in the mining industry, were tested by the authors of the paper, the most efficient of which for sewage treatment appeared to be DP 243, a heterpolar lauryl amine hydrochloride. The optimum dosage of this reagent is usually between 60 and 80 ppm. The retention time necessary for clarification is around 15 min. It readily removes suspended and colloidal matter but little if any dissolved organic matter. The sludge so removed is readily digested if properly seeded. Use of chemical coagulants in conjunction with the reagent does not appreciably im-

prove clarification. This reagent has strong bactericidal power. It is most efficient when the sewage pH ranges between 6.0 and 8.0. The authors do not claim that flotation is at present a satisfactory process for sewage treatment, but it may have possibilities that justify further research. It costs $200 to $300 per million gallons.[C24]

### Effect of Sodium Nitrate on Sulfide Production

Experiments with additions of sodium nitrate to sewage have shown that the former reduces or delays production of sulfide from sewage in proportion to the quantity of nitrate used. This is due not to any direct inhibitive or toxic action of the nitrate but to the increased oxidation of organic matter by the oxygen in the nitrate. Nitrate also reduces the B.O.D. by 0.5 to 0.8 for each unit of oxygen in the sodium nitrate added. The mixing of sewage with trickling filter effluent results in removal of B.O.D. equivalent to the nitrate content of the effluent, the organisms in the effluent playing only a minor role.[C25]

### Sanitation of Trailer Coach Parks

There are more than 125 trailer parks in Michigan with year-round occupancy, averaging 65 trailers per park, and eight are under construction for 450 each, six for 1030 each and others contemplated. They average 2.4 persons per trailer. Water consumption averages about 45 gal. per cap. Less than 10% of these were found to have satisfactory sanitary arrangements, but these are being improved. Proper disposal of waste matters is the item of greatest delinquency and presents the greatest difficulty. It is probable that temporary housing of war workers will require the addition of many more such parks.[C22]

## *Bibliography of Sewerage Literature*

***The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.***

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

*Sewage Works Journal*
*March*

20. A Sewage Project Designed Without Critical Materials. By Paul E. Langdon. Pp. 169-180.
21. Influence of the War on Sanitary Engineering. By Linn H. Enslow, Charles A. Holmquist, Charles Gilman Hyde, William M. Piatt and George J. Schroepfer. Pp. 181-189.
22. Wartime Sanitary Problems of a State Health Dept. By W. F. Shephard. Pp. 190-196.
23. A Critical Review of the Literature of 1942 on Sewage and Waste Treatment and Stream Pollution. Committee report. Pp. 197-241.
24. Sewage Treatment by Flotation. By Chris. A. Hamen and Harold B. Gotaas. Pp. 242-254.
25. *t.* Effect of the Addition of Sodium Nitrate to Sewage on Hydrogen Sulfide Production and B.O.D. Reduction. By H. Heukelekian. Pp. 255-261.
26. Sewage Plant Maintenance in Wartime: Mechanical Units. By John W. Johnson. Pp. 262-279.
27. Plant Maintenance in Wartime: Electrical Equipment and Power Sources. By H. Vance Crawford. Pp. 279-289.
28. Plant Maintenance in Wartime: Maintenance of Grounds. By A. B. Cameron. Pp. 289-299.
29. Plant Maintenance in Wartime: Maintenance of Sewers. By Roy L. Phillips. Pp. 299-310.
30. Significance and Value of Laboratory Tests in Sewage Plant Operation. By LeRoy W. Van Kleeck and others. Pp. 310-325.

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*April 8*

7. Wood Imhoff Tanks Serve an Army Camp. Pp. 96-98.

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21. Fort Dodge, Ia., Makes Profit on Power. By William H. Gottlieb. Pp. 179-181, 187.
22. War Worker Housing Is Maryland Sewerage Problem. By George L. Hall. Pp. 182-183, 187.
23. Sewage Treatment Plants in U. S. A. P. 205.

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6. Polishing the Effluent at Freeport, N. Y. Pp. 64-65, 103.

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8. A Method of Computing Urban Runoff. By W. I. Hicks. Pp. 461-497.

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*April*

3. Two-Stage Biofiltration Sewage Treatment Plant for an Army Camp. By A. H. Jessup. Pp. 168-170.

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*April*

16. Institutional Sewage Treatment and Water Supply. By H. R. Green. Pp. 11-15, 40.
17. Wartime Sewerage "Musts" and "Can'ts." P. 20.
18. *n.* Garbage Disposal in Army Camps. P. 20.
19. Regionalization of Sewage Purification. Pp. 35-37.

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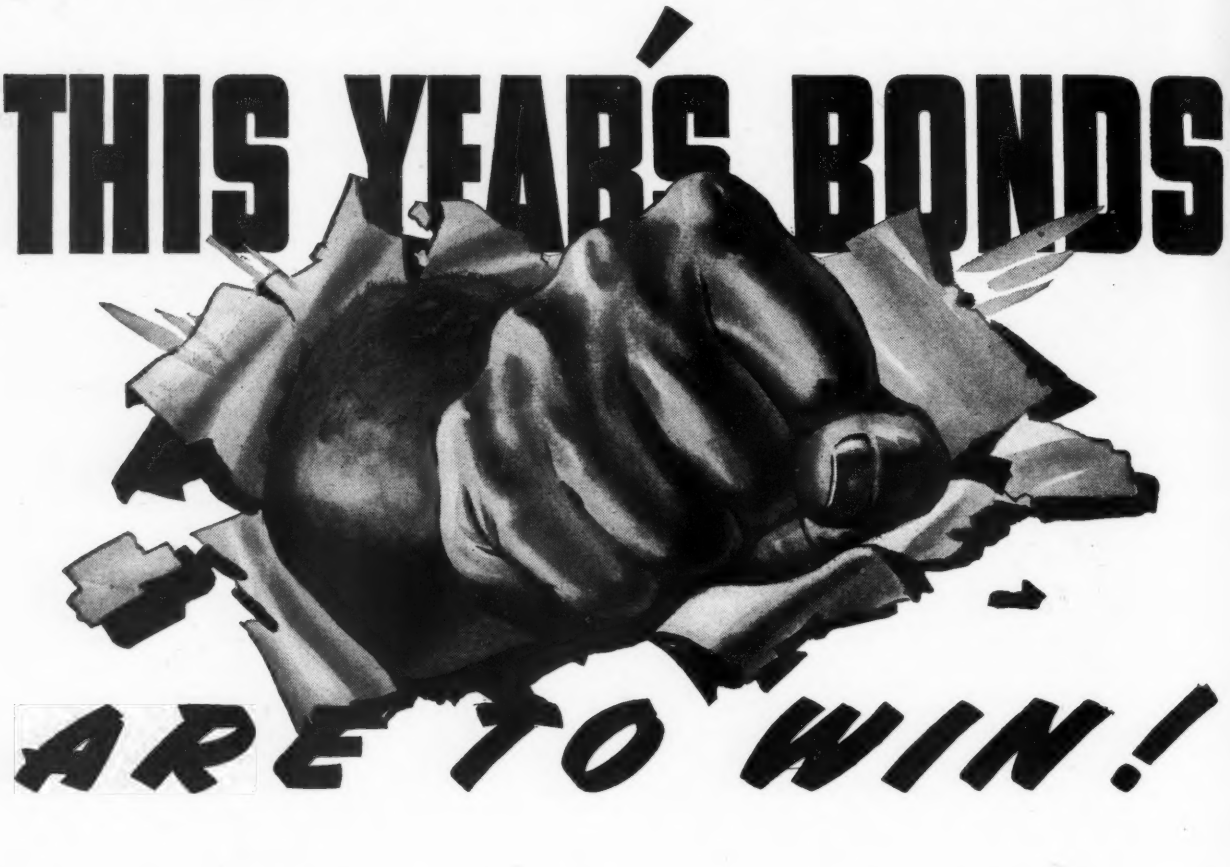


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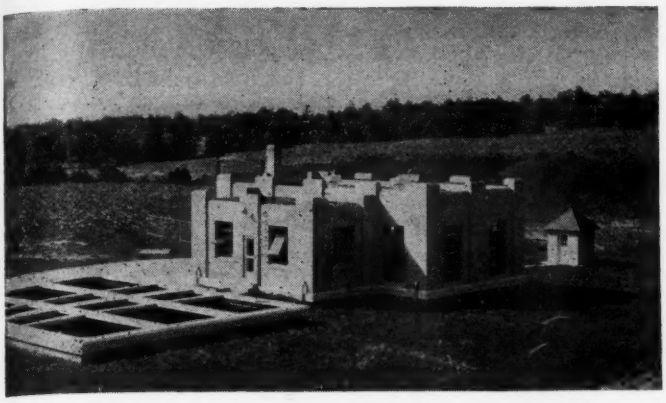


General view of filter and pumping plant, Oldham County, Kentucky.

# The Waterworks Digest

**Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.**

## Rights in Ground Water

The ground water in Raymond Basin, which underlies Pasadena, Calif., and vicinity, has been drawn on beyond its safe yield by 30 large users consisting of municipalities, mutual water companies, an irrigation district, a county water district, public utilities, industries and individuals. After failure to reach an agreement between all these for limiting draft on the ground water, the city of Pasadena filed a suit, and the court appointed the State Division of Water Resources as referee, which spent 2½ years in determining the physical facts, at a cost of $50,000. The referee's report has not been formally filed, but an effort is again being made to obtain a mutual agreement, on the basis of this report, thereby reducing court costs. Most of the parties have informally expressed their willingness to settle on this basis. Among the provisions are: Any party may extract up to 120% of its annual right in any year, but not more than a total of 5 times that right in 5 years. Provision is made for determination of any change in safe yield.

Annually on May 1 parties may request additional water, and those having a surplus must offer to sell it, a ceiling price being established. "This unique feature of limitation of the draft to the safe yield and the legal and physical means of settlement may be applicable to other overdrawn ground-water basins in California."[A54]

## Methods and Control of Chlorination

Studies of water disinfection methods and their technical control are being made by the U. S. Public Health Service Station of Stream Pollution Investigations at Cincinnati, of which this paper is a progress report. They indicate a definite correlation between variations in observed rates of bactericidal action and corresponding variations in the chlorine residuals as determined by orthotolidine, starch-iodide and electrometric methods. This correlation was particularly well marked in respect to the measured oxidation-reduction potential, which shows a sharp upturn at the break-point.

Perhaps the most important conclusions from the study are: 1—The desirability of maintaining free chlorine residuals of 0.1-0.2 ppm where rapid and effective bactericidal action is needed. 2—The desirability of chlorinating waters of any free ammonia content beyond the break-point whenever the high bactericidal power of free chlorine is required. 3—The possibilities afforded by p-aminodimethylaniline as a qualitative or quantitative test for free chlorine under conditions requiring the maintenance of free chlorine residuals in distribution systems.

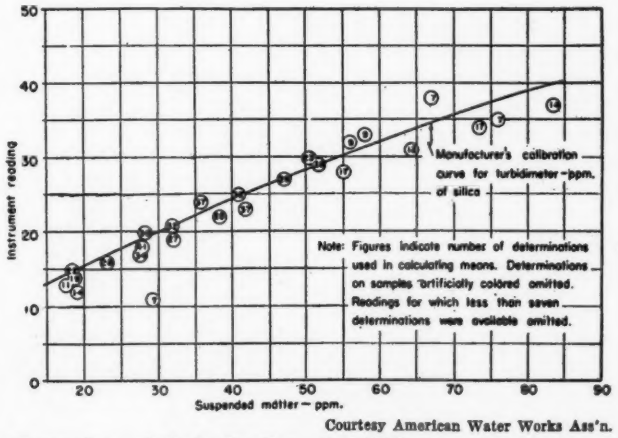
A minimum free chlorine residual of not less than 0.2 should be maintained at all vital parts of a distribution system. Where there is only primary chlorination and no possibility of secondary contamination, an orthotolidine residual, at the point of treatment, of not less than 0.6 ppm may be sufficient for ordinary conditions if the contact period is at least 30 min., and not less than 0.3 ppm if at least 60 min. If there is secondary contamination beyond the point of primary chlorination, these residuals probably would not be adequate because of the time element. If chlorine-absorbing substances other than ammonia are present in the water, their chlorine demand may be a material factor in determining the amount of chlorine required.[A52]

## Turbidity for Estimating Suspended Matter

Knowledge of the quantity of sediment transported in suspension by streams is important in designing reservoirs, canals, water works systems, etc.; but a reliable determination of the average annual and seasonal suspended load transported past a given point by a stream has been possible only if records covering a considerable period were available. Unfortunately, such records for more than 5 years have been kept at very few stations. But at several thousand locations the turbidity of river water has been recorded for years, at some for over 50 years. If a definite relation between turbidity and suspended load could be established, these turbidity records could be used for estimating the latter. Moreover, a turbidity record can be made at less than 1/3 the cost of a gravimetric determination of suspended matter and if it could be substituted for it a saving could be effected.

Studies made by the Sedimentation Division, Soil Conservation Service, U. S. Dept. of Agriculture, of the Enoree river in South Carolina led to conclusions that the relation of turbidity to suspended matter did follow a definite pattern in this river; and presumably similar patterns could be determined for other rivers, and turbidity determinations be substituted for gravimetric, with occasional use of the latter as a check.

But if used for estimating suspended matter in the past, it must be known just what turbidity standards were used, and these must be supplemented by discharge records; and there must be no reason for suspecting that the average coefficient of fineness of the suspended matter has not re-




Courtesy American Water Works Ass'n.

**Comparison of Scale Reading of Turbidimeter With Means of Suspended-Matter Determinations.**

mained reasonably constant; and turbidity and gravimetric determinations over a sufficiently long period must show a reasonably definite average relation of turbidity to suspended matter.[A55]

## Standard Pipe Specifications

The A.W.W.A. has just published tentative specifications for steel water pipe of less than 30″ diameter, and emergency specifications for reinforced concrete pressure pipe; the former approved in March and the latter in January, 1943.

The steel pipe is classified as either Mill or Fabricated; the former is either ⅛″ to 24″ seamless, 1¼″ to 20″ lap-welded, or ⅛″ to 3½″ butt-welded. Mill pipe of all sizes is classified as either electric welded or fusion welded, with either straight or spiral seam.

The emergency specifications for reinforced concrete pressure pipe are "based upon the best known experience and are intended for use under normal conditions," and the advisability of the use of such pipe should be determined by the engineer responsible for the installation in the particular locality concerned. The specifications cover three general types of reinforced concrete pressure pipe: Steel cylinder, 20″ to 150″ diameter, for 100 ft. to 600 ft. operating head; non-cylinder, 20″ to 150″, for 50 to 100 ft. operating head; and centrifugal, 6″ to 84″, 50 to 150 ft. head.[A57 & 58]

## A Novel Pipeline Crossing

A 36-in. pipeline 497 ft. long, of 5/16 in. welded steel, delivered in 36-ft. sections, was welded into one continuous section and pulled across a river 410 ft. wide with a maximum depth of 28 ft. The pipe was assembled on a leveled strip of land in the line of the crossing, welded together, and concrete rings each weighing 1200 lb. were cast around the pipe at 12-ft. intervals to furnish weight to make the pipe sag into the bottom of the trench, which had been dredged 20 ft. wide across the river bottom and lined with 6″ of broken stone. The two ends of pipe line were closed by bulkheads to make it float. Two arms to hold sheaves were welded to the foreward end and a cable passed through each sheave was carried across the river and one end fastened to a deadman, the other to one of two 96 hp tractors. The deadman was a large concrete block cast around a group of about a dozen willow trees. The tractors pulled the pipe across in about 1½ hr. When the pipe was in position above the trench, water was admitted at the ends and air released through a 3″ valved pipe at the middle. When the pipe was in its bed, concrete saddles were placed on it to hold it down if it should be dewatered. No. 4 stone was placed around and under it and riprap on top of it.[E5]

## *Bibliography of Waterworks Literature*

***The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.***

*c.* Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

**A** *Journal, American Water Works Ass'n*
*April*

52. *t.* Progress Report on Studies of Water Chlorination. By H. W. Streeter. Pp. 421-426.
53. Use of p-Aminodimethylaniline as an Indicator for Free Chlorine. By W. Allan Moore. Pp. 427-428.
54. Adjudication of Water Rights in the Raymond Basin. By C. W. Sopp. Pp. 429-438.
55. Use of Turbidity Determinations in Estimating the Suspended Load of Natural Streams. By Richard G. Grassy. Pp. 439-453.
56. Tentative Standard Specifications for Filtering Materials. Pp. 455-470.
57. Tentative Standard Specifications for Steel Water Pipe of Sizes Up To, But Not Including, 30 in. Pp. 471-498.
58. Tentative Emergency Specifications for Reinforced Concrete Pressure Pipe. Pp. 499-511.

**E** *Engineering News-Record*
*March 25*

5. *c.* Pipeline Crossing Built by Novel Method. Pp. 82-84.
6. Cross-Connection Hazards From Refrigeration Equipment. P. 94.

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7. Emergency Waterworks Repairs Under War Conditions. P. 109.

F *Water Works Engineering*
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28. Village Supply Treated by Pressure Filter Plant. By Robert M. Grieve. Pp. 296-298.
29. Hot Water System Explosions Wreck Buildings. Pp. 302-303.
30. *p.* Recent Flood Flows Indicate Many Dams Will Be Destroyed. A.S.C.E. Committee Report. Pp. 304-305, 320.

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31. Treatment Plant Results at Lawrence, Mass. By Nathan N. Wolpert. Pp. 344-346.
32. A Telemetering Method of Water Distribution. By L. T. Tyburski. Pp. 347-348, 360.

G *Water Works & Sewerage*
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13. The Hardy Cross Method. By D. R. Taylor. Pp. 77-91.
14. *p.* Chlorination, Routine and Emergency. By Charles R. Moore. Pp. 99-100.
15. *p.* The Sanitary Engineer in the Post-War World. By Abel Wolman. Pp. 105-108.

J *American City*
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8. St. Paul Likes Soft Water. By L. N. Thompson. Pp. 45-46.
9. Prospecting for Water in a City of Oil Wells. By E. W. DeBerard. Pp. 66-68.
10. Meters, Management and Wartime Problems. By B. E. Payne. Pp. 68-69.

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7. *p.* Chemical Requirements of the New Drinking Water Standards. By Norman J. Howard. Pp. 17, 41.
8. Water Supplies for Relief Airfields. By H. A. McIntyre. Pp. 18-19, 44.
9. Chlorinator Installation at Nanaimo, B. C. Pp. 23, 43.

P *Public Works*
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19. Lewiston, Ida., Water Department Saves Money by Modernizing Equipment. By W. P. Hughes. Pp. 18-19, 38.
20. The Deflector Surface Wash System. By Erwin A. Bartz. Pp. 23-24.
21. Value of Graphs in Waterworks Records. By Amiel Reichstein. P. 32.
22. A Post-War Program for Waterworks Officials. Pp. 34-35.
23. Putting Two Pumps in a Space Designed for One. By J. A. Wallis. Pp. 38, 40.

U *Taste and Odor Control*
*March*

1. *p.* Taste and Odor Control With Activated Carbon on Waters of Low Odor Concentration. By R. B. Adams. Pp. 1-5.
2. *p.* Taste and Odor Control With Ammonia-Chlorine and Activated Carbon. By B. F. Johnson. Pp. 6-7.

## Glue Works Waste Recovery System

The manufacture of glue (from trimmings and fleshings from tanneries) produces, as waste, quantities of solids and grease. The U. S. Glue Division of Peter Cooper Corporations formerly discharged these wastes into a settling basin, with the overflow going to Lake Michigan. But it was difficult to keep the grease from passing into the lake, and to make the solids settle. Last year a plant was installed that recovers the grease and glue-stock solids, the value of which offsets the cost of operation.

The process consists of passing the waste through a stationary bar screen, then through two 6-ft. diameter revolving drum screens with a combined capacity of 3500 gpm. The large solids on the outside of the screen are removed by lifting vanes, which pass them into a flume, which empties into a screenings pit, where they settle out, and from which they are removed by a dewatering screw conveyor, which discharges them into industrial cars.

The smaller solids that pass through the screen are washed from its inner surface by powerful water sprays and float to two 20 x 125 ft. rectangular settling tanks equipped with a Link-Belt "Straightline" sludge collector and "Rotoline" scum skimmer. The sludge is pumped from these to a lagoon.

The scum is delivered by the skimmer into a collecting pit, from which it is pumped to rendering tanks, where a considerable quantity of grease is reclaimed each day.

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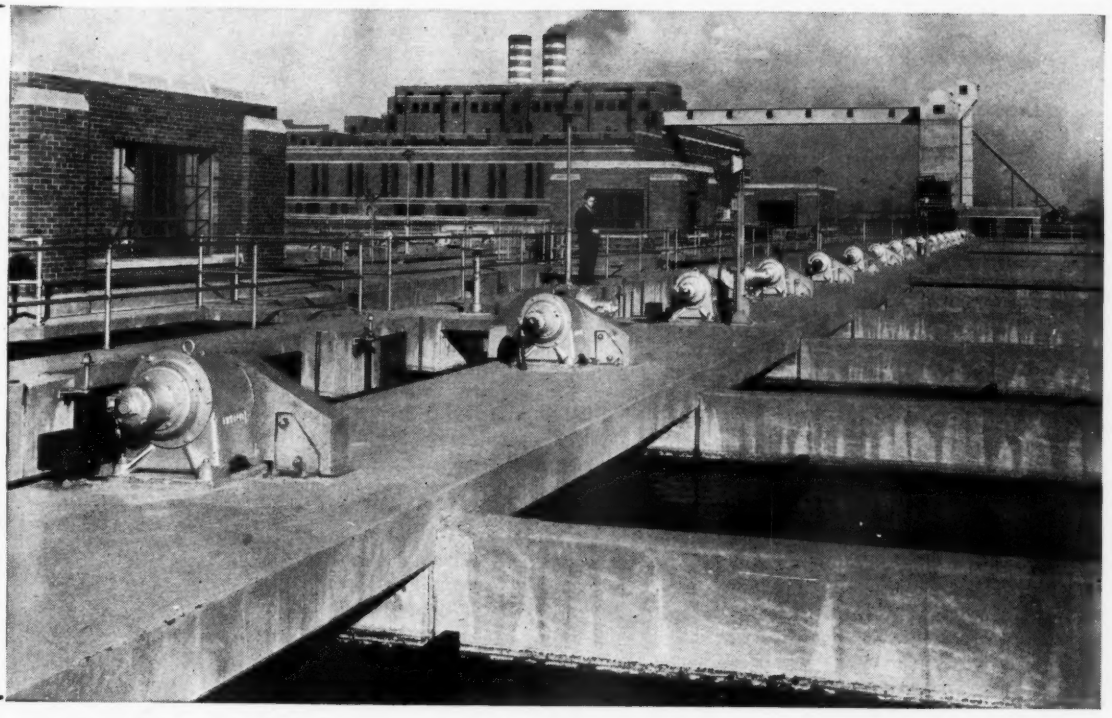
*When you need special information—consult the classified* READER'S SERVICE DEPT., *pages 63-65*

# Dedicated to a Great Task That Lies Before Us

WORLD'S LARGEST ACTIVATED SLUDGE PLANT, Southwest Sewage Treatment Works, Sanitary District of Chicago, is equipped with Link-Belt Straightline sludge collectors for primary and concentration tanks; straightline mechanically-cleaned bar screens; mixers, screw conveyors, and belt conveyors for handling filter cake; water intake screens; coal handling conveyors, as well as power transmission equipment, such as variable speed transmissions, speed reducers, gears, bearings, etc.



## LINK-BELT looks ahead with engineers who plan for better sanitation

● Link-Belt, a company that has developed mechanical equipment for many of the world's most efficient sewage and water treatment plants, now looks ahead to the great task of keeping America the cleanest, healthiest country in a world at peace. The post-war planning of every community should and will include facilities for the proper handling of its sewage and industrial wastes.

With a history of outstanding achievements in the development and manufacture of mechanical handling, screening, aeration and mixing equipment, we offer our experience and facilities to the engineers and operators of America's sewage and water treatment plants in the accomplishment of the great task that lies before them.

**LINK-BELT COMPANY**

Specialists in the Manufacture of Equipment for Water and Sewage Treatment Plants
Philadelphia Chicago Cleveland Indianapolis Los Angeles Toronto
Offices in principal cities

91 5

# LINK-BELT

**SCREENS · COLLECTORS · AERATORS · GRIT CHAMBERS · MIXERS**

# Keeping Up With New Equipment

## Conference on War Winning Water Works Operation

***June 15-18, 1943***

**MEETS AT CLEVELAND**

*Sixty-Third Annual Meeting*
*American Water Works Assn.*
*500 Fifth Ave., New York, N. Y.*

The A.W.W.A., in planning its second Wartime Conference, selected Cleveland as the site because it is conveniently located for the greatest number of Association members.

A minimum consumption of time is planned and week-end travel will not be necessary for more than a few of those who attend.

Two full days—Wednesday and Thursday, June 16 and 17—and two part days, Tuesday afternoon and Friday morning, June 15 and 18—limit the proceedings.

Is there any water works man in America today who knows all the answers—even about his job and his industry? Is it not true that many water works men wish to inform themselves as fully as possible so that they can do their work better? What water works man is there who will not be able to meet wartime needs of his community better by spending a few days at the Conference at Cleveland? Answer that yourself!

**Helpful Program**

Plans for the Technical Sessions include Willard Chevalier and Abel Wolman in an evening session devoted to postwar planning. University hydraulics education surveyed by President-elect Morris. A panel discussion of labor relations in water works plants. A discussion of current personnel problems by Philip Niles. War Production Board policies reviewed by Arthur E. Gorman. Water supply practice in Army training centers reviewed by L. H. Kessler. Coating materials for cast-iron pipe covered by Lenhardt, Wiggin and others. Concrete pressure pipe and its layings discussed by DeBerard and Howson. Arthur Collins of Westminster, England, with a message from our British contemporaries. New materials for water works considered by Weir of St. Louis and Dawson of Iowa University. A public session of the Steel Pipe Committee—one topic for consideration will be field welding of steel water mains. A startling discussion of a possible method of treatment of water to prevent tooth decay. A review of the new Federal Drinking Water Standards. An exhibit and discussion of departmental motion pictures as good-will builders. And finally, a contest with cash prizes for the best papers by superintendents on "Meeting the Wartime Emergencies."

**A Superintendent's Prize Session**

Through the generosity of one of A.W.W.A.'s fine members, it has been possible to plan a competition program for water works superintendents as a feature of the Cleveland Conference.

One session of the Plant Management and Operation Division will be set aside for the five best papers submitted by superintendents or managers of water departments or companies.

The topic is to be:

*How We Met Wartime Emergency Conditions in Our Town*

The papers are to be planned to include material along the following lines. How we made the old plant carry more load. What substitute materials have been successfully used? What changes in practices, such as meter reading, billing, etc., have been made and with what results? What reduction in use of automotive equipment for customer and maintenance services has been made? What water saving campaigns have been carried on? What has been the manner of advising the public in all these matters? What has been the customer's attitude?

The above topics are suggestive, but not intended to be exclusive. Any other situation which has been met in a fashion suited in wartime conditions can be described.

The prizes awarded will be in cash amounts of $50, $40, $30, $20 and $10.

Co-Headquarters will be the Carter and Statler Hotels. Meetings in both hotels. Exhibits and registration at one hotel. President's reception and annual dinner at the other.

City employees should note that municipalities are exempt from the federal tax on payments for rail, bus, boat and airplane transportation. Form 731, covering this exemption, can be obtained at the nearest office of the Treasury Dept. Internal Revenue Service. Municipal employees should see that these forms are obtained and used to expedite their city's underwriting expenses for attendance at the A.W.W.A. Conference.

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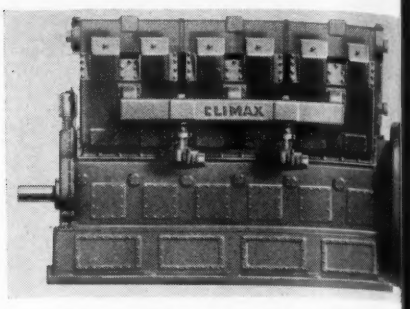
## New, All Purpose 435 H.P. High Speed Gas Engine

*Climax Engineering Co.*
*Clinton, Iowa*

The manufacturer says the new V-12 Blue Streak Engine has a normal speed range of 600 to 1200 r.p.m. and a brake horsepower of 435, meeting today's demands for a high speed engine which will mesh with modern power consuming machinery for operating large pumps and compressors, rock drilling, driving construction machinery and, with suitable generators, a low cost means of generating electric power.




**Climax V-12 Blue Streak Engine.**

Among the outstanding design and operating characteristics which make this new engine a newsworthy prime mover are:

*Wide Fuel Range* — It will deliver peak power on natural gas, butane, gasoline or other fuels. Change-over is quick and easy with standard, outside located accessories.

*Economical Dual Carburetion*—Provides complete and uniform fuel distribution which results in full power and low consumption of fuels used.

*Dependable Dual Ignition* — Each cylinder has two spark plugs. These provide a greater flame, increase power output and remove the possibility of ignition failure. Should one plug fail, the other will continue to operate.

*Perfect Turbulence* — The specially shaped combustion chamber assures maximum turbulence for perfect combustion. Its shape, and the location of spark plugs reduces the tendency to *detonate* when sudden or sustained overloads are encountered.

As a standby power unit the V-12 is claimed to be particularly efficient and when connected with a suitable generator will produce electric current in volume and at low cost.

For utilizing sewage gas, Climax engines are in use in a large number of plants and are producing power for driving pumps, generating electricity for lighting and other purposes.

Standard design features include wet cylinder sleeves, seven-bearing crankshaft, overhead valves, aluminum (5-ring) pistons, rifle drilled connecting rod and fuel changeover devices. Where required, Climax will furnish a complete range of accessory equipment such as starting devices, air cleaners, filters, radiators, heat exchangers, etc. All of these may be selected to meet the specific needs of the particular installation.

For more complete information—specifications, test data, recommended applications, write to Climax Engineering Company, Clinton, Iowa.

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## Midget Adjust-O-Feeders

*%Proportioneers, Inc.%*
*Providence, R. I.*

These new pumps contain many novel design features such as straight through drive shaft which permits operating up to 8 units from a single central motor and a fully enclosed support frame which presents a pleasing appearance as well as protecting the moving parts from dust and dirt and eliminating the necessity of guards.

The Midget Adjust-O-Feeder is available in either plunger or diaphragm type, and plunger units range in capacities from 0 to 10 GPH. When equipped with Bakelite or plastic cylinders, pumps are capable of discharging against pressures ranging from 0 to 150 lbs. With stainless or iron cylinders, pressures up to 1000 lbs. can be safely handled. Both plastic and metallic measuring cylinders have built-in check valves. The former having rubber or Neoprene face discs and the latter being equipped with balls.

All plunger type Adjust-O-Feeders are equipped with %Proportioneers% FLUID SEALED stuffing gland for hard to handle and corrosive fluids. The fluid seal encloses all moving parts in a flowing water bath, soap solution or a neutral oil, depending upon the job conditions.

Diaphragm type Midget Adjust-O-Feeders are built in capacities ranging from 0 to 7½ GPH and for pressures from 0 to 100 lbs. Diaphragms are preformed reinforced Neoprene, and as no stuffing gland is required, the fluid seal is omitted. Diaphragm heads are of "see-thru" plastic with built-in suction and discharge check valves having sight feed domes.

Changes in displacement are made through neutralizing eccentrics, one of which is movable and the other fixed. The movable eccentric carries a scale in small increments from 0 to 10, and changes in throw are made by means of special screwdriver furnished with each pump.

Complete engineering details will be supplied by %Proportioneers, Inc.% upon request.

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### P.F.T. Introduces Simple Equipment for Removing Supernatant Liquor

*Pacific Flush-Tank Co.*
*4241 Ravenswood Ave., Chicago, Ill.*

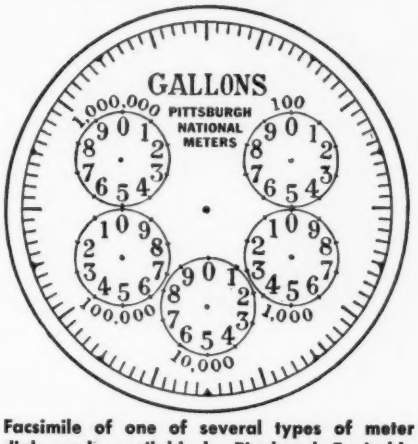
In the digestion of solids separated from the liquid portion of raw sewage by sedimentation, probably the most troublesome problem is that of withdrawing and disposing of the supernatant liquor. To do this effectively, the Pacific Flush-Tank Co. has brought out a supernatant liquor selector.

It consists of a slotted tubular device mounted vertically at the center of the digester and extending throughout that part of the depth from which the supernatant liquor is normally withdrawn. The tube is equipped with slots that are sufficiently narrow to hold back liquid containing large amounts of suspended solids. The tube is 7½" outside diameter and is fitted with a 6" standard pipe flange at its lower end, and is furnished in a 10'-0" length. It is desirable to supply the digestion tank with an overflow, but no other points of draw-off for supernatant are required.

Liquid is taken off at a slow rate and over a long period of the day. Accordingly, it is desirable that the liquid be withdrawn from the supernatant draw-off line by means of a small pipe approximately 2" in size into a sampling sink.

An outstanding feature of this new piece of P.F.T. equipment is its simplicity of construction and ease of installation.

For detailed information and blueprints, write to the Pacific Flush-Tank Company, 4241 Ravenswood Ave., Chicago, Illinois, for Bulletin 143.




**Facsimile of one of several types of meter dials made available by Pittsburgh Equitable Meter Co., Pittsburgh, Pa., for printing customer meter reading cards.**

### Customer Meter Reading Cards Prove Popular

*Pittsburgh Equitable Meter Co.*
*Pittsburgh, Pa.*

According to the Pittsburgh Equitable Meter Company, a good many



*When you need special information—consult the classified* **READER'S SERVICE DEPT.**, *pages 63-65*

water departments are printing cards that show a facsimile of the meter register dial. These cards are left at premises where the meter reader cannot gain access at the time of his regular call. Printed instructions ask the consumer to mark the position of the hands of the meter on the imprinted dial and drop the card in the mail. This practice largely eliminates call-backs, conserves gasoline and rubber and alleviates to some extent the man power shortage.

As a cooperative measure, the Pittsburgh Equitable Meter Company will furnish, without charge, suitable printing plates for any type of Pittsburgh or National meter register, to be used in preparing cards similar to that described above. Address such requests to the nearest branch office or direct to the Advertising Department at 400 N. Lexington Ave., Pittsburgh, Pa. Indicate the type of meter for which the register facsimile is desired (Arctic, Tropic, Keystone, IMO, Nash, Empire, etc.) and specify whether the dial should be of the round reading or straight reading type, recording in gallons or cubic feet.

## A New Coagulation Aid for Water Purification

*Philadelphia Quartz Co.*
*121 S. Third St., Philadelphia, Pa.*

A process patent (U. S. Pat. No. 2,310,009) for water purification by a special coagulation aid has been granted to Chester L. Baker and Charles H. Dedrick and assigned to the Philadelphia Quartz Co.

The patent covers a method for preparing a special solution of sodium silicate and a metal salt, which mixture is introduced to raw water prior to the addition of the coagulant. This coagulation aid is for the purpose of inducing a more rapid formation of larger floc, thus removing a higher percentage of the suspended impurities. The silicate-metal salt method has already been used in several water purification plants.

For information on its method of application, write to the Philadelphia Quartz Company, 121 S. Third St., Philadelphia, Pa.



## Knox New President of Bucyrus-Erie

In a series of changes designed to give increasing responsibility to younger men, N. R. Knox was elected President of Bucyrus-Erie Company, South Milwaukee, Wisconsin, at a meeting of the Board of Directors held in South Milwaukee on April 5.

Mr. Knox has been with the Bucyrus-Erie Company for 23 years. Upon leaving Harvard in 1920, he started work in the company's foundry as a special apprentice. His experience includes service as Electric Furnace Melter, Assistant to the Foundry Superintendent, Foundry Superintendent, General Superintendent, Works Manager and Assistant to the Vice President. He became Vice President in Charge of Manufacturing in 1933 and held that office until his recent election to the presidency.

## F. W. Jones Appointed Sanitarian in Reserve

Frank Woodbury Jones, Partner in Havens and Emerson, Consulting Engineers, Cleveland and New York, has been appointed Sanitarian in the Reserve, United States Public Health Service, and has been assigned to duties as Regional Sanitary Engineer, Fifth Area, O.C.D.

## Arthur T. Knoerzer Dies

Arthur T. Knoerzer, Vice President and General Manager of Champion Corporation, Hammond, Ind., familiarly known by his many friends as "Art," passed away on March 25.

## Henry N. Armbrust Remains with Builders-Providence and Associated Companies

Mr. H. S. Chafee, Treasurer of Builders-Providence, Inc., and %Proportioneers, Inc.%, associated companies located at 9 Codding St., Providence, R. I., announces that Henry N. Armbrust is now associated with Builders-Providence. Mr. Armbrust will serve as a research engineer with Builders, and in this capacity will have a leading part in the company's expanding market and product research program.

Mr. Armbrust first became associ-

ated with %Proportioneers% in January, 1935, starting as sales representative in the State of New Hampshire. In October of the same year, he was transferred to the main office and shortly became one of the key men in %Proportioneers% organization. He will continue to spend some time with that company as Consulting Engineer.

Mr. Armbrust is a graduate of Rhode Island State College, class of 1929, with a B.S. in Chemistry. During the past few years he has made a number of original contributions to the water and sewage works fields. The new arrangements will provide greater opportunity for the exercise of his talents in this respect.

Henry N. Armbrust with Builders-Providence, Inc.

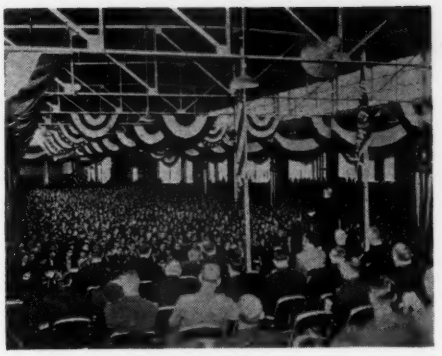
## Army-Navy "E" Awards

*Johns-Manville*

More than 4,000 Johns-Manville workers and members of their families who packed into an improvised auditorium to celebrate formal raising of the Army-Navy "E" flag over their Manville, N. J., factory on March 24, received a remarkable tribute from Major General Thomas E. Robins.

"I am convinced," General Robins said, "that you men and women of the Johns-Manville factory have a wider and more diversified part in the war effort than any other group in the United States."

Referring directly to some products not ordinarily linked with fighting equipment, Major General Robins told of the essential role they played. "Not only do you help make it possible for our armed forces to fight," he pointed out, "but you play a vital part in training millions more to join the more than a million and a half fighting men we already have overseas. Throughout the United States these young men, the flower of American manhood, are being sheltered in buildings in which your shingles, wallboard and other building materials are to be found—the best sheltered troops in the world! All these items—and dozens more—together with new war products and secret uses of materials that cannot be revealed now —make your part in the war effort one of which any group of men and women can well be proud."



Presenting Army-Navy "E" to Johns-Manville

The major general, chief of the Construction Division, O.C.E., and other Army and Navy officers inspected the Johns-Manville plant earlier in the day. The flag ceremony, staged at noon in one of the huge warehouse buildings that had been cleared for the occasion, was followed by a luncheon in which the entire plant personnel, wives, families and visitors were served.

*American Cast Iron Pipe Co.*

For excellence in the production of war materials, the Army-Navy "E" was awarded to the American Cast Iron Pipe Co., Birmingham, Ala., on March 24. For the Army, Col. E. C. Bomar, District Chief of the Birmingham Ordnance District, and Lt. Comdr. Edwin Phillips represented the Navy and presented the pins to employees.

*LaPlant-Choate Mfg. Co.*

The Army-Navy "E" burgee flies over the LaPlant-Choate Manufacturing Co., Inc., of Cedar Rapids, Iowa, following award ceremonies held March 10 in the plant Shipping Building. During the presentation of the honor flag to the employees, Brigadier General Stuart C. Godfrey, Air Engineer, Army Air Forces, stressed the use and importance of LaPlant-Choate earthmoving equipment in the battle to keep airports and other vital installations in service. Mr. Roy E. Choate, President, accepted the award. Captain David C. Hanrahan, U.S.N., presented the "E" pins to representative employees, Miss Verda Widger, Mr. Harland Hopkins and President Choate.

*Navy E to De Laval Steam Turbine Co.*

The Navy Board for Production Awards has granted a renewal of the Navy "E" Award made in May, 1942, to the De Laval Steam Turbine Co., Trenton, N. J., for excellence in industrial production. The new award is for a period of six months, dating from November 15, 1942, and carries the right to add a White Star to the Navy "E" burgee flown over the plant. The formal presentation of the Navy "E" burgee with the White Star added was made at a ceremony held in the De Laval plant on January 27.

## NEW APPOINTMENTS

*New City and County Officials recently reported:*

### *City Engineers*

O. L. Skinner, Montgomery, Ala.
J. H. Allin, Pasadena, Calif.
Thomas R Nelson, San Rafael, Calif.
C. R. Studinski (Acting), Pueblo, Colo.
Carl B. Dippell, Freeport, Ill.
B. C. Sones, Bogalusa, La.
W. E. Zimmer, Mason, Mich.
Leon H. Cass (Acting), Ithaca, N. Y.
A. F. Hallinan, Kingston, N Y.
G. Lyle Stillman, Rome, N. Y.
L. C. Bailey, Knoxville, Tenn.
Arch L. King, Lubbock, Tex.
Richard J. Podolske, Watertown, Wis.
John Gouin, Lander, Wyo.

### *City Managers*

Carl W. Fuehrer, Ephrata, Pa.
R. C. Hoppe, Sweetwater, Tex.

### *Public Works Superintendents*

Albert J. Cada, Berwyn, Ill.
D. L. Giddings, So. Portland, Me.
John W. Bush, Knoxville, Tenn.

### *Water Works Superintendents*

W. W. Jackson, Harrison, Ark.
R. P. Shattuck, Clinton, Ind.
L. J. Kokjohn, Fort Madison, Iowa
Thomas J. Quigley, Chelsea, Mass.
John Gaddy, Caruthersville, Mo.



J. A. Renquist, Scottsbluff, Nebr.
Rex Price, Sidney, Ohio.
Walter A. Ferguson, Rapid City, S. D.
Bud Hester, Kilgore, Tex.
Charles Corbett, Lamesa, Tex.

### *County Engineers and Officials*

Carr F. Greer, Navajo Co., Holbrook, Ariz.
Julius Irion, Maricopa Co., Phoenix, Ariz.
Chas. de St. Maurice, Colusa Co., Colusa, Calif.
Henry J. Burk, Imperial Co., El Centro, Calif
John R. Burnham, Colano Co., Fairfield, Calif.
Wallace B. Boggs, Alameda Co., Oakland, Calif.
Arthur L. Kiefer, Sacramento Co., Sacramento, Calif.
John C. Oglesby, Marin Co., San Rafael, Calif.
Arnold M. Baldwin, Santa Cruz, Co., Santa Cruz, Calif.
H. W. von Dorsten, Yolo Co., Woodland, Calif.
J. G. Burns, Mercer Co., Aledo, Ill.
Joseph R. Fay, Hancock Co., Carthage, Ill.
C. R. Melton, Mason Co., Havana, Ill.
C. H. Harney, Morgan Co. (Acting), Jacksonville, Ill.
Otto C. Hardin, Clay Co., Louisville, Ill.
Lee Atkinson, Pulaski Co., Mound City, Ill.
Frank L. Warren, Richland Co., Olney, Ill.
S. H. Berkstrom, Ford Co. (Acting), Paxton, Ill.
Guy S. Little, Moultrie Co. (Acting), Sullivan, Ill.
Robert H. Cunningham, Christian Co., Taylorville, Ill.
R. C. Craig, Appanoose Co., Centerville, Iowa.
Roy Grimes, Wayne Co. (Acting), Corydon, Iowa.
Walter H. Cullen, Dubuque Co., Dubuque, Iowa.
J. C. Mors, Webster Co., Fort Dodge, Iowa.
J. W. Fair, Ida Co. (Acting), Ida Grove, Iowa.
W. H. Bennett, Buena Vista Co., Storm Lake, Iowa.
Ed. M. Johnson, Coffey Co., Burlington, Kan.
Frank Irwin, Cherokee Co., Columbus, Kan.
Chas. Smitley, Geary Co., Junction City, Kan.

# Readers' Service Department

**These booklets are FREE but distribution is restricted to those actively engaged in engineering or construction. Use the coupon below or write the manufacturer direct, mentioning PUBLIC WORKS.**

## Construction Materials and Equipment

**Air Raid Shelters**

3. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

**Bridges**

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

**Cement Dispersion**

9. "Economics of Cement Dispersion and Pozzolith" tells the complete story of how cement dispersion reduces water required up to 20% and increases workability 150%. Write The Master Builders Co., Cleveland, Ohio, for a copy.

10. A valuable treatise on available means of securing high strength, prevention of sealing, increased durability and improved wear resistance in concrete pavement construction. Master Builders Co., 7016 Euclid Ave., Cleveland, Ohio.

**Cold Mix Plants**

15. New catalogs and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus, Ohio.

**Cold or Wet Weather Construction**

18. Cleaver Aggregate Heaters and Dryers, Hot Water Boosters, and Automatic Steam plants are designed to speed up cold or wet weather construction. Write for illustrated bulletins. Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

**Concrete Accelerators**

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

**Concrete Curing**

33. 64-page manual of concrete curing with calcium chlorides. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

**Concrete**

36. "Cutting Concrete Costs"—Booklet analyzes costs and outlines methods of figuring the lowest cost schedule. Notes on job planning. For copy, write Lone Star Cement Corp., 342 Madison Ave., New York, N. Y.

**Concrete, Early Strength**

38. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit, Mich.

**Concrete Mixers**

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

**Drainage Products**

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

**Drainage**

71. Walker Poroswall Rapid Drain Pipe for Drainage or Water Collection is claimed to be the fastest drainage medium known. Send for latest literature explaining its many uses. Walker Cement Products Co., Little Ferry, N. J.

**Graders, Patrol**

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

**Mixing Plants, Asphalt**

106. The Cleaver Asphalt Mixing Plant for an inexpensive plant mix and the Cleaver Tank Car Heater and Bituminous Booster are covered in illustrated catalogs sent on request by Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

**Mud-Jack Method**

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

**Oil, Motor**

109. "Here's Proof of Ring-Free Superiority," 32 pages, illustrated, outlines the principles of lubrication and explains how by simple tests you can measure the advantages of Macmillan Ring-Free Motor Oil. Write Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

**Paving Materials, Bituminous**

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

**Pumps**

120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester,

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

**Road Building and Maintenance**

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Gallon Iron Works & Mfg. Co., Gallon, Ohio.

**Rock Drill Maintenance**

130. New booklet presents through amusing cartoons useful hints on proper rock drill maintenance methods—what your men can do to get more work out of your tools with a minimum of expense for repairs and compressed air. Write The Cleveland Rock Drill Co., 3734 East 78th St., Cleveland, Ohio.

**Rollers**

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

**Rotproofing**

145. Cuprinol, a rotproofing chemical that protects wood from fungi and insects, yet has no offensive odor, is non-poisonous, does not corrode metal and can be painted over. Get full details in booklet from Cuprinol, Inc., 7 Water St., Boston, Mass.

**Soil Stabilization**

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set

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City ..... State .....

forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 24 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

154. "Soil Stabilization with Tarvia"—An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

### Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

### Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich., for Bulletin No. 29.

### Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

### Wellpoints

195. New complete catalog, "Griffin Pointed Wellpoint Facts," just issued. Covers pre-drainage, describing wellpoints, jetting pumps, with tables, diagrams, and illustrations. Griffin Wellpoint Corp., 881 E. 141st St., New York.

## Street and Paving Maintenance

290. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. These are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati, O.

## Fire Apparatus

300. Detailed information and advice about specially engineered Ward LaFrance apparatus will be sent on request. Ward LaFrance Div., Elmira, N. Y.

## Snow Fighting

### Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

### Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Div., Wyandotte Chemicals Corp., Wyandotte, Mich., tells how to use calcium chloride for modern ice control.

## Sanitary Engineering

### Aero-Filter

356. "Results Produced by Aero-Filters" is a new pamphlet covering results at Temple, Texas; Paris, Ill.; Webster City, Iowa; and Mason, Mich. Write Lakeside Engineering Corp., 222 West Adams St., Chicago, Ill.

### Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

### Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

### Activation and Aeration

376. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.

### Blowers

379. All interested in low cost air for sewage disposal will want a copy of this catalog describing operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

### Chlorinators, Portable

380. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark, N. J.

381. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers, Inc., 96 Codding St., Providence, R. I.

### Cleaning Sewers With Own Forces

383. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

384. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boul., Los Angeles, Calif.

### Consulting Engineers

385. "Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.

### Feeders, Chlorine, Amonia and Chemical

387. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.

### Filters

388. How to increase the capacity of filters through use of Anthrafilt and complete data on use of Anthrafilt for filters and sludge beds is contained in a revised pocket Manual issued by Anthracite Equipment Corp. For free copy write H. G. Turner, State College, Pa.

### Filters, Vacuum

389. Continuous vacuum filters for dewatering sludge like those used in the new Cranston, R. I. sewage plant are described and illustrated in a 48-page booklet issued by The Eimco Corp., 634-666 South 4th West St., Salt Lake City, Utah.

### Fire Hydrants

390. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

391. See listing No. 410.

### Flow Meters

392. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

### Gas Holders and Digesters

393. Clarifiers, sludge digesters and other tanks and gas holders for sludge gas. Graver Tank & Mfg. Co., Inc., 332 So. Michigan Ave., Chicago, Ill.

### Gates, Valves, Hydrants

394. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

### Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

### Laboratory Equipment

403. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore, Md.

### Maintenance

404. "The Lubriplate Way" contains much valuable information on long-lasting Lubriplate lubricants which are especially adapted for difficult conditions such as parts that are immersed in sewage, water or steam. Write Lubriplate Division of Fiske Brothers Refining Co., 129 Lockwood St., Newark, N. J.

### Manhole Covers and Inlets

405. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

### Meters, Venturi

406. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

### Pipe, Cast Iron

408. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York, N. Y.

409. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

410. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa.

### Pipe, Lock Joint

412. Lock Joint Reinforced Concrete Sewer Pipe. Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

### Pipe, Transite

414. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

### Pipe Joints Sewer

415. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Adams, Mass.

### Pipe, 2-inch Cast Iron

417. Generously illustrated booklet describes McWane 2-inch cast iron pipe and its manufacture in streamlined pipe shop. Write McWane Cast Iron Pipe Co., Birmingham, Ala.

### Pipe Joint Compounds

418. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

### Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

### Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

### Screens

434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.

### Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 48 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York. N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

### Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

445. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York, N. Y.

### Sprinkling Filters

447. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

### Swimming Pools

448. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

### Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

### Treatment

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

454. A full line of equipment for sewage disposal including clarifiers, chemical treatment plants, rotary distributors, gas holders and many other pieces of equipment are described in a new bulletin just issued by Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

461. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York, N. Y.

466. Flocculation with Floctrols. For details on controlled flocculation, tapered mixing, practical elimination of short circuiting, rapid settling of properly flocculated solds write for Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

### Underdrains, Trickling Filter

468. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh, Pa., for free copy.

### Valves (See Gates, Air Release, etc.)

### Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

### Water Works Operating Practices

490. "Important Factors in Coagulation" is an excellent review with bibliography and outlines of latest work done in the field. Written by Burton W. Graham and sent free on request to Stuart-Brumley Corp., 516 No. Charles St., Baltimore, Md.

### Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.

## New Catalogs

### Centrifugal Blowers and Exhausters

Roots - Connersville Blower Corp., Connersville, Ind., has issued Bulletin 120-B-12 covering its centrifugal blowers and exhausters. This is a twenty-page booklet in two colors, profusely illustrated, applying to both single and multi-stage units in many sizes.

The foreword includes a brief history of the company's experience since 1854 in building centrifugal units, together with a list of applications, and goes on with a discussion of the advantages inherent in the centrifugal design. Pages four and five discuss the operating characteristics, with curves to substantiate the statements contained in the text.

Pages six to eleven inclusive are devoted to sectional views, types of impellers, and installation and shop cuts of the various single-stage units which comprise the Roots-Connersville line. Pages twelve to seventeen picture the multi-stage line in equal detail.

One page is devoted to a discussion of various control devices which provide suitable regulation, and another page contains a number of action views of various manufacturing and testing operations.

Copies of Bulletin 120-B-12 may be had by addressing the factory at Connersville, Ind.

### Safety Equipment Conservation Handbook

Just published is a comprehensive 32-page handbook entitled "How to Make Your Safety Equipment Last Longer" —ready for wide distribution as a public service.

Covering every type of personal protective equipment, from Protective Hats, Gas Masks, Respirators and Gas Instruments, through the list to Safety Clothing, this well-illustrated publication details the practical "do's and don'ts" of safety equipment care for key personnel, in a form readily adaptable for instruction of equipment users.

Illustrated throughout by marginal drawings pertinent to the text, the M.S.A. Conservation Handbook is available without cost to any responsible official, upon request to Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh, Pa.

### Rusta-Restor Under New Ownership

The Johnston & Jennings Company, 864 Addison Road, Cleveland, Ohio, widely known manufacturer of Oceco tank fittings and Stowe industrial stokers, has purchased the exclusive manufacturing and sales rights of Rusta-Restor, a cathodic (i.e. electrical) process for preventing rusting of water tanks, piping and similar steel structures, which has been tested and approved by the American Water Works Association, Factory Mutual, and other Laboratories and is said to have won highest commendation from users in both the municipal and industrial fields.



## ADVERTISERS

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